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STUDIES ON CLIMATE AND CROPS *

2. THE YIELD OF WHEAT IN THE UNITED STATES AND IN RUSSIA DURING THE YEARS 1891 TO 1905

BY

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The following figures† show, in millions of bushels, the wheat crops in the United States and Russia for the years 1891 to 1905. The diagram (fig. 1) simplifies the comparison of these figures.

	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905
U. S.....	611	515	396	460	476	427	530	675	547	522	748	670	637	552	692
Russia.....	278	356	478	465	413	412	340	459	454	422	427	607	621	666	636

By this diagram we see at once the extremely interesting fact that during the years 1891 to 1897 and 1901 to 1905 the variation in the values for Russia and the United States is just opposite, while during the years 1897 to 1900, on the contrary, the two curves are similar, the quantity of crops increasing and decreasing simultaneously in the two regions. This fact leads us to the following suppositions:

1. That the variations in harvests are such that very bad years in one region of the globe are precisely years of excellent yield in another region; 2. That the centers of compensation are not always to be observed in the same regions; it does not necessarily follow

* Paper 1 in this series appeared in the April BULLETIN, pp. 270-282.

† I. M. Rubinov: Russian wheat and wheat flour in European markets, p. 15, Washington, 1908 (U. S. Dept. of Agric., Bur. of Statistics.—*Bull.* 66).

that when the crop yield is large in the United States it is small in Russia, or *vice versa*; 3. That to meet the needs of the international market there may be exceptional years of insufficient compensation.

My argument is that these suppositions are well founded. I also admit that a close connection exists between agricultural and climatic variations, and that, in the final analysis, changes in the

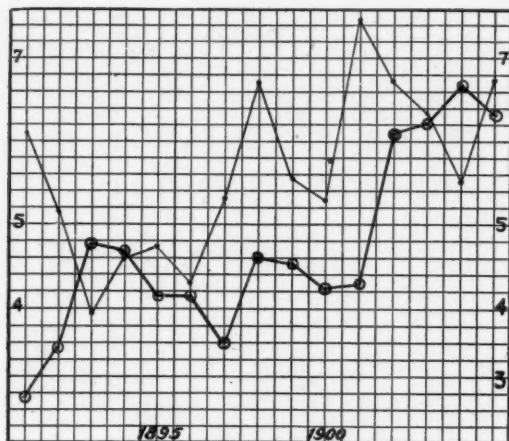


FIG. 1.

quantity of energy radiated by the sun and received by the earth are, most frequently, the cause of temporary increase or decrease in prosperity in different regions of the globe.

Before proceeding further I wish to make two remarks. I must draw attention to the fact that my method of discussing the problem of the influence of the variations of solar phenomena on the yield of crops is quite different from that of W. S. Jevons, Sir John Eliot and others; and then, that the great importance of the influence of climatic variations on crops is far from being recognized by the most competent specialists on the subject.

One of the final conclusions of Professor Cleveland Abbe's report on the relations between climates and crops reads:* "... the yield per acre for any one of the ten principal crops ... has probably never been either increased or diminished by 50 per cent. of

* Cleveland Abbe: First report on the relations between climates and crops, p. 364, Washington, 1905 (U. S. Dept. of Agriculture, Weather Bureau, *Bull.* No. 36).

the normal yield per acre by climatic influences alone over any large region, such as 100 square miles; and, further, the total annual harvest for any given crop in the United States is not likely to be diminished 5 per cent. by the occurrence of an inclement season in some one portion of the country."

At present I could not discuss the question of the climatic influence on the yield of crops in all its details. It is sufficient to look through Professor Abbe's report to see how difficult this question is. But it seems to me that the first work to be done, preparatory to discussing the problem, is purely geographical, because, in order that it may be possible to learn for what regions (and for what years) the meteorological conditions should be especially studied, from month to month, we must know the geographical distribution of excess and deficit in the yield of crops.

Such is precisely the object of this paper.

Now, coming back to the wheat crops in the United States and in Russia, we must observe that, taking into consideration the increase in population and the improvements in agriculture, it is easy to understand why the two curves of my diagram must ascend, and, from that fact, one must admit that the sudden falls of the curves are due to natural causes, independent of the will of men or needs of the market.

Now, in the United States the production of wheat fell off, during the years 1891 to 1893, from 611,780,000 to 396,132,000 bushels, a difference of 215,648,000.

The same is noted from 1893 to 1900, and from 1901 to 1904 the decrease was quite as characteristic.

In Russia the curve descends from 1893 to 1900, and the contrast in the values of the years from 1902 to 1905 with those of the preceding years is very marked. To have comparable figures, and independent of the areas of soil used for agricultural purposes, it is necessary to consider the yield per acre. Notice now, that a decade of years is a period of time not long enough to have the figures much influenced by agricultural improvements, which would increase the yield of crops, and that the soil, in a region of new colonization, cannot be exhausted to any great extent in ten years. In consequence, it seems to me that instead of comparing the yield per acre from one year to the next, and from one region to another, it is just as well to consider the annual departures from the means of a period of ten years.

For example: the yield per acre in the State of Maine in 1891 was 16.3 bushels, in 1892, 16.7, &c., and the mean for the years

1891 to 1900 is 18.9. I can write therefore -2.6 for 1891, -2.2 for 1892, &c. These figures of deficit or surplus of bushels per acre can be used to draw maps.*

The figures utilized to establish the annual departures for the different States of the Union are those given by Charles C. Clark.† The figures for the provinces of Ontario and Manitoba are taken from Canadian official publications.‡ As the departures are written on the following maps (figs. 2-11) it is unnecessary to reproduce them in tabular form.§

To simplify the examination and comparison of the maps I have drawn curves of equal departures. In this way the areas of deficit and surplus can easily be distinguished.

From the examination of these maps it may be inferred that the two first hypotheses expressed on the subject of compensations are correct. For, looking at the geographical distribution of the departures, one must acknowledge that centers of exceptionally good or bad harvests really exist, that the extent of these areas is generally much smaller than the extent of the United States, and also, that the points where the most favorable or the most unfavorable conditions are centered, displace themselves, and that, in reality, we have to do with a phenomenon of a dynamical order.

The maps of the years 1893 and 1898 should be examined to begin with.

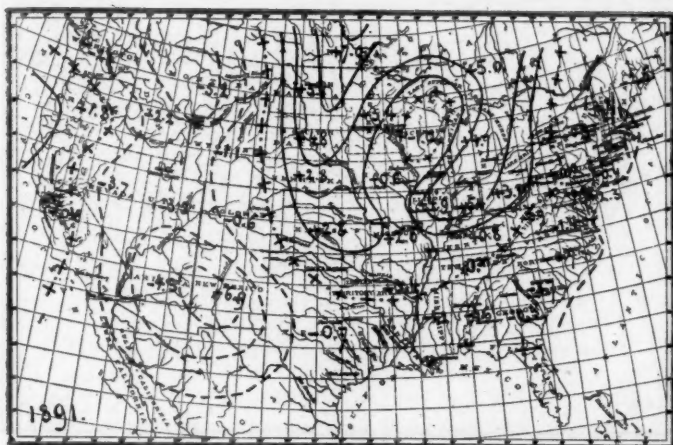
The wheat crop was bad almost all over the United States in 1893, while in 1898, on the contrary, the harvests were above the average, one may say, everywhere. But, in both cases, the values of the figures are disposed in such a fashion that we are bound to admit that the factors upon which the crops depend proceed by waves. In 1893 the figures -7.3 , -7.2 , -7.6 for the States of Nevada, Utah and Colorado occur along a line at the end of which we observe the departure -4.3 in Kansas, and farther on, -1.2 and -1.3 in the States of Arkansas and Mississippi. Beside this negative wave, there is one of positive values extending from North Carolina to Indiana, and on the prolongation of this wave we note,

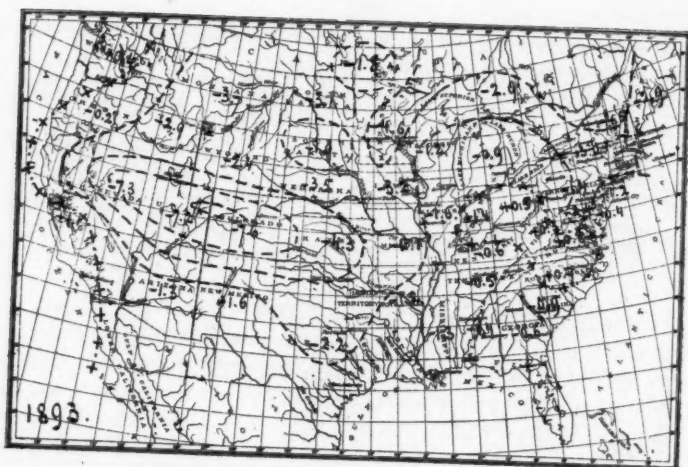
* The average yield being quite different from one region to another (the extreme means for the ten years 1891 to 1900 are 7.2 for South Carolina and 25.2 for Montana), it would be well to correct the departures by calculating them in per cent. of the average yield. I used the uncorrected departures in making my maps.

† Wheat crops of the United States, 1866-1906. (U. S. Dept. of Agriculture, Bureau of Statistics—*Bull.* 57, Revised.)

‡ Nineteenth Annual Report of Ontario Bureau of Industries, p. 25.
Statistical Year-Book of Canada, 1900, p. 79.

§ The maps show that the departures for Vermont must be considered as being doubtful





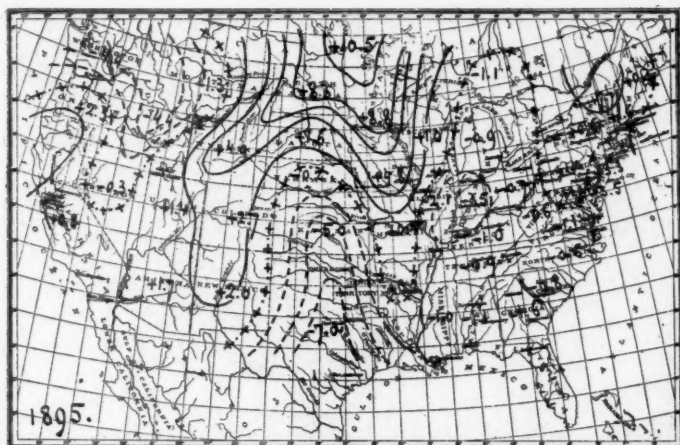


FIG. 6.

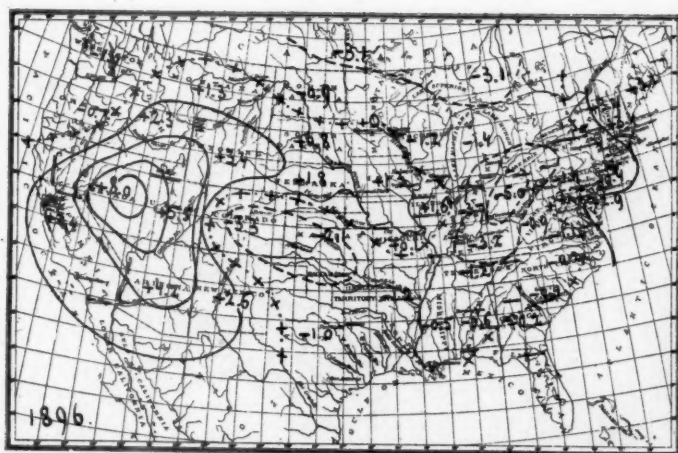


FIG. 7.

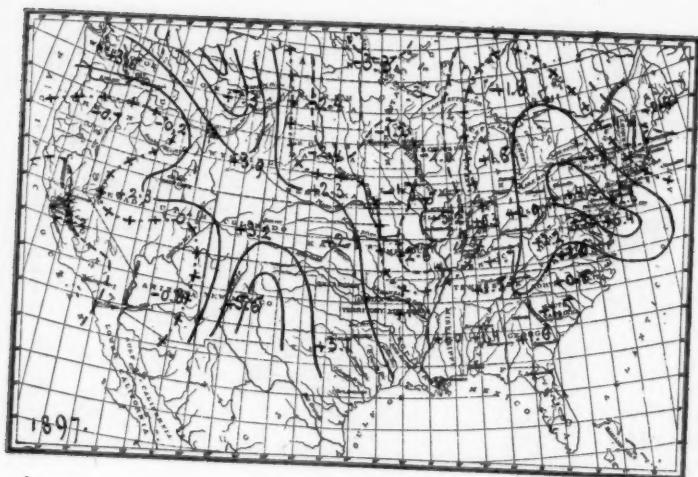


FIG. 8.

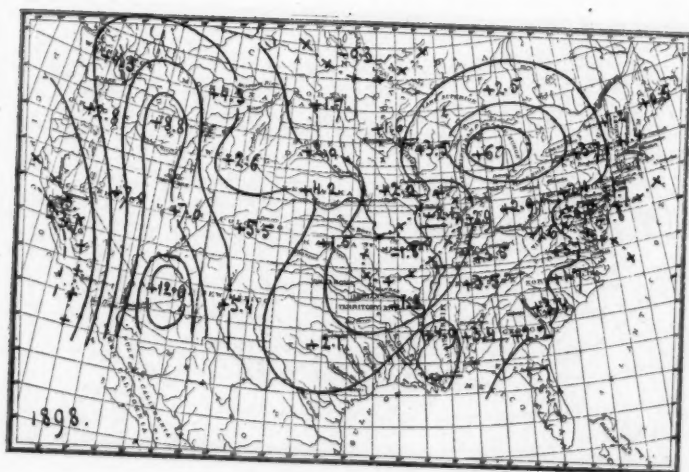


FIG. 9.

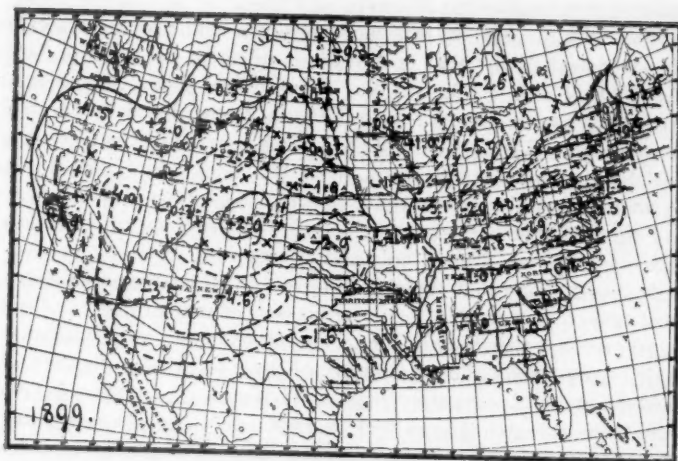


FIG. 10.

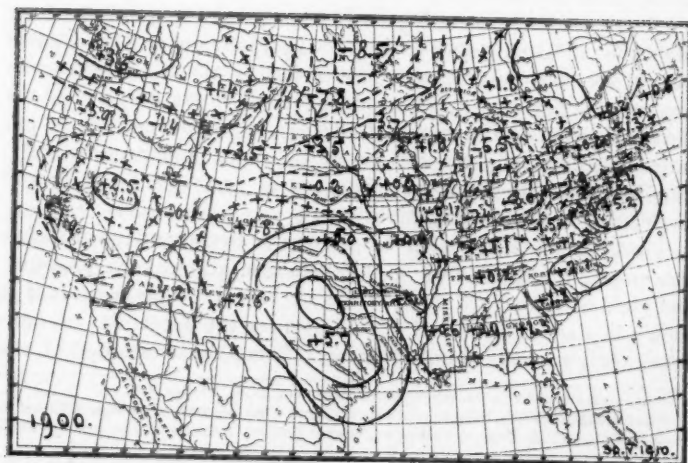


FIG. 11.

H.A.

in South Dakota, the departure — 1.9, which is less negative than those in the neighboring States.

The map of 1898 is still more curious. The excessive value of +12.9 bushels per acre in Arizona is followed by +7.0 in Utah and Nevada and +8.8 in Idaho; more to the north the crest of this positive wave extends into Canada, since the departures in Montana and Washington State are +4.3. Another positive wave, less distinct, however, extends from the Gulf of Mexico to the Great Lakes, and between these two waves of excessive crops we find values below the average, —0.3 in the Province of Manitoba, and —2.1 and —1.8 in Illinois and Missouri.

It seems to me that these phenomena could not be explained by local causes, independent of the anomalies of meteorological conditions, and that the study of the climatical changes, on the contrary, shall supply a scientific explanation of these facts. Now let us compare the maps of successive years. Those of 1891, 1892 and 1893 show some interesting points of resemblance. The positive area of 1891 extends from Canada to Arkansas. In 1892 this area diminished in extent, and the center of highest positive value moved from Manitoba to Kansas, and instead of +7.9 it is +4.7 that we note. In 1893 there are still positive departures, but only in a small portion of the country, and the highest value (Indiana) is reduced to +1.4.

Thus: a decrease in extent and a displacement in the opposite direction to the hands of a clock. The negative wave stretching, in 1891, from Montana to Mexico, seems to have followed the same movement. A really curious fact to be remarked is, that I noted exactly the same movement on the maps of annual departures of temperature.* I do not insist on this detail as the question of the correlations between crops and the dynamical phenomena of climates must be fully studied, point by point and progressively, step by step. However, two facts are at present sufficiently well established to attract our attention.

First, the areas occupied by positive or negative departures on the maps of annual data of temperature, atmospheric pressure, and yield of wheat are comparable in extent. The same fact is shown in a series of maps I have drawn for the departures of rainfall observed in the United States.† Then, the disposition of the

* Arctowski: *L'enchainement des variations climatiques*, p. 105, Brussels, 1909.

† This research will form the subject of a special paper. The utilized data are those published by Frank H. Bigelow (U. S. Dept. of Agriculture, Weather Bureau, Climatological Division, Abstract of data No. 3).

The departures which I have utilized to draw the maps have been calculated in per cent. of the normal values, exactly in the same way as H. R. Mill has done for the rainfall maps of Great Britain and Ireland. (British Rainfall, 1908.)

thermopleions and anti-pleions of my maps of annual temperatures forced me to admit the existence of waves which displace themselves. In my preceding paper* I have shown that for atmospheric pressure the same thing most probably exists. As the maps of wheat crops give similar indications, it is reasonable to admit that the crops depend on the same atmospheric changes as those which cause the appearance and propagation of thermopleions and anti-pleions, as well as hyper- and hypopressure areas. I have already insisted upon the waves which appear on the maps of 1893 and 1898. I wish to add some words about those of the other departure-maps of wheat crops which are sufficiently well marked to be worthy of mention.

The positive wave which, in 1894, extends from the Great Lakes to Texas, shows two centers of excessive positivity, very lightly joined. A third nucleus of excessive crop appears on the extension of this wave towards the NE. In Nebraska a departure of -5.2 counterbalances that of $+5.7$ of Indiana.

The map of the following year looks as if there had been a displacement towards the W. with an accentuation of positivity. In this hypothesis the departure $+10.5$, of Manitoba, would be due to the surplus center $+5.7$ observed in Indiana in 1894. The maps of 1897 and 1898 show a case of exactly the same kind and quite as interesting. The positive wave extending from Montana to New Mexico, in 1897, is seen the following year a little farther to the W. At the same time the positive wave of 1897, the crest of which is directed from Lake Huron to Cape May, followed this movement, going to the NW. The transformation of the map of 1899 into that of 1900, if any connection does exist between the two maps, can only be explained, it seems, by a northwesterly displacement. Moreover, if the map of 1899 but slightly suggests the existence of two systems of waves, directed from the NE. to the SW. and from the NW. to the SE., that of 1900 shows these intercrossing waves so clearly, that one must be prejudiced not to admit their existence.

Let us see now how things went on in Russia and Central Europe.

From the data of a paper by I. M. Rubinow† and those collected

* *Bull. of the Amer. Geogr. Soc.*, vol. 42, p. 270.

† I. M. Rubinow: Russia's wheat surplus, p. 29, Washington, 1906. (U. S. Dept. of Agric., Bureau of Statistics—*Bull.* No. 42.)

by Frank R. Rutter,* I have formed the means and the departures of the means shown in the following table:

REGIONS.	MEAN.	1891.	92.	93.	94.	95.	96.	97.	98.	99.	1900.
	Bush. p. acre:										
Centr. agric. region....	9.0	-5.4	-4.1	+2.5	+2.9	+3.6	-1.2	-3.5	0.	+1.8	+3.1
Middle Volga.....	6.8	-3.8	-0.9	+0.1	+2.7	-0.8	+2.8	-1.3	-1.8	+2.5	+0.9
Lower Volga.....	7.1	-4.7	+2.8	-1.0	+2.9	-0.2	+1.5	-1.8	-1.8	+0.3	+2.2
New Russia.....	7.7	-2.1	-1.5	+5.1	+2.0	+0.6	-0.6	-1.3	+1.8	-1.9	-1.5
Little Russia.....	9.6	-2.4	-2.9	+2.0	+1.8	+1.9	-1.3	-0.8	+2.6	-0.1	-0.4
Southwestern region...	13.1	-3.1	-3.3	-1.4	+3.0	+2.9	+2.1	-4.8	+3.9	+4.5	-4.0
Ural.....	10.3	-6.1	-1.5	-1.6	+1.9	+0.3	+2.9	+0.1	-0.8	+3.2	+2.1
Moscow industr. region.	8.9	+0.5	-1.4	-0.5	+0.7	-0.4	+0.5	+0.5	+0.8	+1.3	-2.8
White Russia.....	10.4	-0.7	+0.5	+0.1	+0.4	-1.5	-0.4	-1.4	+1.9	+1.3	-0.3
Lithuania.....	11.3	-1.5	-0.9	+0.8	-0.3	-1.0	0.	+0.3	+1.9	+1.2	-0.5
Baltic region.....	15.7	-0.8	-5.0	+0.5	+0.6	-3.2	+0.7	+0.5	+2.4	+3.4	+1.3
Sweden.....	24.8	-0.1	-0.2	-2.5	+0.1	-3.7	+1.9	+1.5	+0.4	-0.4	+3.2
Roumania.....	14.6	-1.9	+2.7	+4.3	-1.9	+4.7	+4.5	-5.4	+1.7	-8.3	-0.2
Germany.....	25.2	-6.8	-1.4	-0.4	-0.2	-0.8	+1.2	+0.1	+2.0	+3.2	+2.7
Hungary.....	17.9	+0.5	+0.6	+1.6	+0.3	+2.8	+1.5	-6.2	-0.8	-0.1	-0.6

I have put these figures on maps in order to get a clear idea of the geographical distribution of annual surplus or deficit of the crops of wheat. These maps are much less detailed than those of the United States, where 44 departures could be utilized each year. I do not reproduce my drawings because later I hope to obtain the necessary data to make detailed maps, which will in consequence be more accurate. Therefore I shall restrict myself at present to a few statements of a general order.

In Russia, as in the United States, there are no regions which could be considered as being the permanent centers of the observed variations. It is not always the same provinces of the Empire which are the most or the least favored. So it seems that in Europe, as in America, the zones of surplus and deficit displace themselves. However, the variations are more accentuated as the distance from the ocean increases. It is in the south of Russia and toward Asia that the changes of the crops are most pronounced. The greatest difference in the annual yield of wheat per acre, for the ten years taken into consideration, is 6.9 in Sweden, where the average is 24.8. In the lower basin of the Volga (provinces of Samara and Astrakhan), where the annual yield is only 7.1, that is to say less than the third of that of Sweden, the difference between the values of the years 1891 and 1894 reaches 7.6 bushels per acre, a fluctuation which is therefore four times greater than that observed in Sweden. In Rumania also the difference between the greatest departures is 13.0 for an average crop of 14.6.

* Frank R. Rutter: Cereal production of Europe, Washington, 1908. (U. S. Dept. of Agric., Bureau of Statistics—Bull. No. 68.)

Let us examine the geographical distribution of the departures for the years 1891, 1893 and 1897, that is to say the years for which the total production of wheat in Russia is most strikingly in contrast to that of the United States.

In 1891 the yield of crops did not surpass the average of the ten years except in the "industrial region" of Moscow (provinces of Tver, Moscow, Kaluga, Yaroslaw, Vladimir, Kostroma). A positive departure was also observed in Hungary, but there, as well as in the region of Moscow, the excess was only $+0.5$. In Germany the negative departure was -6.8 , and in the central agricultural region of Russia and in the E. and SE. of the Empire the departures are, all proportions maintained, still more negative. The figure -0.7 , for White Russia, indicates that the two centers of very bad crops in question were separated by a wave of better yield of crops, by a wave directed from the region of Moscow towards Hungary.

The geographical distribution of the departures for 1893 shows the existence of a wave which crosses the Russian Empire in a perpendicular direction to that of the positive wave of 1891, inasmuch as the figures permit a judgment. It is in Rumania and in southern Russia that the most positive departures are observed, and then, it is from the Don and the Volga towards the Baltic Provinces that the wave in question extends, separating the regions characterized by a deficit in crops. On this point it is interesting to notice that the negative wave of 1893, in the United States, followed also an almost perpendicular direction to that of 1891.

In 1897 the boundary line between the positive and negative departures, in Russia, extends from E. to W., from the Ural towards Germany. The crops are a little above the normal value in the N. (in Sweden even $+1.5$ per acre), while in the S. they were very bad, especially in the SW., and in Hungary and Rumania, as well as in the central agricultural region (provinces of Riazan, Tula, Orel, Kursk, Voronezh, Tambov) where a second center of deficiency is observed. A comparison with the United States leads to very suggestive conclusions.

As an hypothesis, I may venture to say that on both sides of the Atlantic, across North America and across Europe, and perhaps even Asia, a common factor of dynamical order governs simultaneously all the variations.

Notwithstanding the fact that the maps I have drawn for Russia are much less satisfactory than those for the United States, I cannot refrain from adding to the preceding remarks that, in 1898

1899 and 1900, years during which the curves of fig. 1 are not of an opposite character, the maps show certain analogies which are really striking. In 1898, in Russia, the departures are + 3.9 in the W. and — 1.8 in the E. A great positive wave seems to cross Europe from the N. to the S. The American map shows something similar. In 1899, in Europe as well as in America, the values are negative in the S. and positive in the N. The departures of 1900 observed in Russia suggest an intercrossing of waves quite the same as seems to have been the case in the United States.

From the fact that in Russia and in the United States the variations of the figures of wheat crops, for the years 1897 to 1900, are similar, I have deduced the conclusion that, for the needs of the international market, there may be exceptional years of insufficient compensations.

To be convinced of this it is sufficient to examine the price of wheat in England.*

In 1891-92 the price of grain was 101.6 cents a bushel; then the price diminished till 1894-95, when it was as low as 64.8; rose again to 110.3 in 1897-98, then gradually went down to about 80 cents.

GRAIN CROPS AND POTATOES IN THE UNITED STATES, 1891-1900 (IN MILLION BUSHELS).

PRODUC- TION OF	1891	92	93	94	95	96	97	98	99	1900
Corn....	2,060	1,628	1,619	1,212	2,151	2,283	1,902	1,924	2,078	2,105
Oats.....	738	661	638	662	824	707	698	730	796	809
Wheat....	611	515	396	460	467	427	530	675	547	522
Potatoes..	254	156	183	170	297	252	164	192	228	210
Barley....	86	80	69	61	87	69	66	55	73	58
Rye.....	31	27	26	26	27	24	27	25	23	23
Buckwheat	12	12	2	12	15	14	14	11	11	9
Total...	3,792	3,089	2,933	2,603	3,868	3,776	3,401	3,612	3,756	3,736

Following another idea, the above table gives in millions of bushels the production of corn, oats, wheat, potatoes, barley, rye and buckwheat, for the years 1891 to 1900, in the United States.†

By adding the figures we see that the agricultural production diminished during the years 1891 to 1894 from 3,792,000,000 of bushels to 2,603,000,000, making a deficit of 1,189,000,000 bushels,

* Rubinow: loc. cit., *Bull.* 66, p. 77.

† U. S. Dept. of Agric. Bureau of Statistics—Bulletins: 56, 57, 58, 59, 60, 61 and 62.

which is almost a third, or perhaps more, if the figures were divided by the numbers of inhabitants forming the population of these years.*

It seems to me unnecessary to dwell on the signification of the preceding figures from the commercial point of view. On the other hand, I cannot let pass without comment certain apparent contradictions. The variation of the production of wheat, for example, is notably different from that of potatoes. It is easily understood that certain meteorological conditions favorable to wheat might be unfavorable to the development of potatoes. The same thing is true of corn. R. H. Hooker has made a detailed statistical study of the meteorological conditions favorable or unfavorable to the different crops in England.†

He has found that in England, of course, "the absence of rain in September and October is more important to the wheat crop than rain or temperature at any other period of the year." Another interesting result of Hooker's work is that "the advantage of cool weather during spring and summer for the great majority of the crops" . . . is a "feature [which] stands out with quite unexpected prominence."

It is probable that in other climates conditions are not the same, and it is clear that the influence of each meteorological factor should be studied, region by region and separately, for each particular cereal. The difficulties in the way of foreseeing the yield of crops are enormous. However, this problem can be attacked and its solution is attainable.

I think I have shown that the maps giving the annual distribution of wheat crops are of such a character that, in order to explain them, it is necessary to have recourse to meteorological influences depending on the general circulation of the earth's atmosphere.

The amount of meteorological observations which has been accumulated in the course of years is enormous, and it is perfectly possible, at present, to study scientifically the simpler problems of the climatical changes. I really believe that even if the true connections between the causes and the effects escape us, yet practical results will be obtained by applying purely empirical methods.

* The increase of the population from 1831 to 1834 was about 3,788,000 (Statistical Abstract of the United States. 1908).

† R. H. Hooker: Correlations of the weather and crops. (Journ. Roy. Statistical Soc., vol. 70, p. 1. London, 1907.)

ASCENT OF MOUNT ROBSON, THE HIGHEST PEAK IN THE CANADIAN ROCKIES

BY

GEORGE KINNEY

On Friday, Aug. 13, 1909, Donald Phillips and I congratulated each other in at last capturing that most difficult peak, Mt. Robson. We stood on the needle point of the highest and finest peak of all the Canadian Rockies. I doubt if ever a peak was fought for more desperately, or conquered under greater difficulties.

Situated in the heart of the Rockies, some fifty miles or more north of the Yellow Head Pass, and hundreds of miles from civilization, the mountain could only be reached by pack-train after long weeks of strenuous effort, through trackless forest and muskeg, by nameless mountains and raging torrents. I have the honor of being the first white man known to have stood on its rugged sides.*

Dr. A. P. Coleman, Geologist of the University of Toronto, organized an expedition in 1907 to capture Mt. Robson. The party consisted of Dr. Coleman, his brother, L. Q. Coleman, myself and a helper. The four of us, with our pack-train of ten horses and outfit, left Laggan on Aug. 2, 1907. We followed the Pipestone, Siffleur Saskatchewan, and Athabasca rivers; crossing the Pipestone and Wilcox Passes.

For weeks we made our own trails through the wilds, and forced our way through hundreds of miles of tangled underwood. Rafting our equipment over the Athabasca, across which we had to swim our horses, we hurried over the Yellow Head Pass, and swung down the Fraser. But our trip that year left Mt. Robson still unconquered, though we explored its western side, and I discovered Mt. Turner and the "Valley of a Thousand Falls."

*Mr. James McEvoy of the Canadian Geological Survey, who described this region in the *Annual Report of the Geological Survey of Canada* (Vol. XI, 1898), says that the top of the mountain is usually completely hidden and rarely is it seen entirely free from clouds. The actual height of the peak is 13,700 feet, or 10,750 feet above the valley. The face of the mountain is strongly marked by horizontal lines, due to the unequal weathering of the rocks, and has the appearance of a perpendicular wall. From the summit to the base, the slope is over 60° to the horizontal. Mr. McEvoy adds that, though the mountain had long been known, its height had never been determined nor was it thought to be conspicuously notable in elevation; but since the heights of Mounts Brown, Hooker and Murchison have been proved to be greatly exaggerated, Mount Robson has the distinction of being the highest known peak in the Canadian Rockies. Mr. Kinney is a clergyman.

The three of us renewed our attack in August, 1908. This time Dr. Coleman secured John Yates, an experienced packer, to take us in charge. Going in by way of Edmonton, we followed very nearly the route the Grand Trunk Pacific is now taking, crossed the Yellow Head and followed down the Fraser as far as the Moose River, a tributary of the latter. This time we attacked Mt. Robson from the East side, by tracing the Moose River to its source and then a branch of the Smoky. The story of our fight for the peak that fall, is briefly told in the *Canadian Alpine Journal* of 1909.* The region for miles around the splendid peak was explored, and many peaks all about it were ascended. The mountain itself was attempted on several occasions, but the difficulties were so great that we had to give up, after spending twenty days at its foot.

I left the mountain that fall, believing that I had made my last attempt to climb it. But in the spring of 1909, Mt. Robson had still such a hold on me that I could not rest satisfied till I had made another attempt. I then made arrangements with John Yates for another trip, and planned to reach Mt. Robson several weeks earlier than the year before. In May I received word that foreign Alpinists had designs on Mt. Robson. Telegraphing Yates that I was starting at once, and expected to meet him on the trail, I left Victoria on June 2, for Edmonton to outfit an expedition of my own. I had counted on one of my brothers making the trip with me, but, at the last moment, he could not get off. I was in Edmonton about a week before I finally got my outfit together. This delay cost me dear, for I was caught in the floods of the Athabasca. Another disappointment awaited me in Edmonton for a letter from Yates told me it would be utter folly to think of starting on a trip to Mt. Robson at that time, because the very late spring had left the mountains and passes full of snow. But I had gone too far to back out then, and snow or no snow, I decided to make the attempt.

On Friday, June 11, with only \$2.85 in my pocket, but with three good horses packed with three months provisions, I started off alone for Mt. Robson, hoping to pick up some one on the trail who would share fortune with me. But for hundreds of miles across the prairies and through mountain fastness I fought alone the great diffi-

* An editorial note in the article referred to says that the leading feature of this second attempt to ascend Mt. Robson was the plucky and desperate climb made by Mr. Kinney alone when he spent a night on the mountain. "He would have spent a second night but for a promise to his companions to return. The succeeding day was fine, and had he remained he would undoubtedly have reached the summit and made the first ascent of this noble peak, a conquest he richly deserved."



FIG. 1.—MT. ROBSON FROM THE EAST.

Two miles of glacier ice in foreground. It was up this side that Dr. Coleman's party, in 1903, and the British Alpine Club Expedition, in 1909, toiled in vain for the summit.

culties of the trip, threading my way across treacherous bog, or swimming my horses across mountain torrents.

On the MacLeod River, I picked up an old-timer, who wanted to go along with me. Selling him one of my horses and half of my provisions, we shared together for a few days, the joys and hardships of the trail. But the dangers of the trip, and the floods of the Athabasca were too much for him so he dropped out and I was alone again with only two horses.

I nearly lost my whole outfit in the swollen Rocky River, and my saddle-horse and I had to swim for our lives. Then a cloud-burst flooded the whole valley of the Athabasca beyond anything ever known in those parts before, leaving me stranded on a little island and my horses on another. On that occasion I had to shift camp three times, wading waist deep through the raging waters, carrying my provisions and outfit on my back to a place of safety. The floods not only made the rivers impassable, but also the small streams as well, so that I had to make a trail over the mountain sides. When I reached John Moberley's (a half-breed's place), where I expected to swim my horses across the Athabasca, I found several parties of Indians and prospectors held up by the floods. That night the Indian dogs stole all my store of bacon, and to make matters worse, the Indians had no pemmican and all I could buy to replace my stolen meat was a can of lard.

It was here that Donald Phillips rode into camp wearing on his hat the silver badge of the Guides' Association of Ontario. A sturdy youth of twenty-five, he was looking up the country for future guiding purposes, and I soon had him interested in Mt. Robson. He was on his way back for provisions and had his camp on a little island, half a day's ride down the Athabasca, where he, too, had been caught in the floods. Phillips and I swam our horses back to his camp and got things together, so that the next day, leaving behind us Indians and prospectors, who claimed that we would find the trails impassable for another week, we swam our horses across the Athabasca and entered the Yellow Head. From Swift, an old-timer near there, we obtained some more provisions, and then we left the Athabasca.

I found in Phillips a very prince of the trail. Quick, handy, a splendid cook and bubbling over with good nature, he made a campmate that could not be excelled. Never in all the hard days that followed did he utter a word of discouragement, or falter in our undertaking, and though he had never climbed mountains before that

summer, he proved to be a cool-headed and cautious climber. I have seldom seen his equal.

We reached Mt. Robson from the East and camped at tree-line on its north shoulder. Here the Grand Forks, flowing from the big east glacier and Berg Lake, which I discovered and explored in 1908, plunges in a mighty cataract into the "Valley of a Thousand Falls."

We made our permanent camp and turned our horses loose to fatten for three weeks on the sweet mountain grasses. The next day being Sunday we rested. This was July 25, 1909. From where we camped, Mt. Robson rose in one sheer unbroken wall from base to highest summit, and, at such a fearful angle that a snow cornice, breaking off the peak, would fall 7,000 feet before it could come to a stop. Yet we spent no time looking for a chance to climb, for I knew of a narrow, rugged way up those walls of rock and crumbling ledges that I had found the year before.

On Monday afternoon, with fifty pound packs on our backs, we worked our way up the cliffs and narrow ledges of that north shoulder of Mt. Robson, till we reached the big shale slope on the north-west side of the mountain, at about 9,500 feet. There in the shelter of Island Cliff, an isolated wall of rock on the shale slope, we spread our blankets and watched the setting sun paint a wonder-world with its glorious colors. We called that spot Camp "High Up." At sunrise the next morning we started for the peak.

The year before I had crossed that shale slope alone to a big shoulder of cliff, nearly a mile to the south, and then, in a blizzard, had climbed some 500 feet of cliff, till my aneroid read 10,500 feet. The storm was so thick that I could see no distance; but from photographs that I had taken of the western side, I believed it possible to make the peak, if that shoulder on the west could be climbed.

But when Phillips and I stood on the shale slope, and looked at the rugged cliffs above us, we believed, by working our way up its snow-filled couloirs, we could reach the peak quicker than by going around to the south according to our first plan.

This west side of the mountain we found free of snow to about the 11,000 foot line; but the cliffs above the shale slope were more difficult than we had imagined, and it was slow work. The snow in the couloirs, which we had thought would offer good climbing, was so steep and hard that it could only be ascended by means of laborious step climbing. From early morning, till 3 o'clock in the



FIG. 2.—MT. ROBSON FROM THE NORTH.

Kinney and Phillips camped four nights on this side among the cliffs above the snowline. Their dash for the peak was made from Camp "Highest Up," on the high west shoulder, on extreme right. In the foreground, the Grand Forks leaps a 200 feet precipice and begins its journey through the "Valley of a Thousand Falls."

afternoon, we struggled up that wall of rock and ice, and in all that time we succeeded in reaching an altitude of only a little over 11,000 feet. The weather was glorious, and the scenery of this show spot of the Alpine world beggars description. The warm sun kept the avalanches busy all about us, and loose rocks often whistled past us. Sometimes they came from cliffs so high above us, that without any warning, and issuing seemingly right out of the sky, they would scream past us in awful flight to be engulfed in the silence below. We could hear them strike nothing, either coming or going. In descending, that afternoon, we discovered a far easier way up than the one we had tried, so we determined to utilize it on our next attempt.

Returning to our "High Up" camp, we cached blankets and instruments, and then hastened to our permanent camp at the base of Mt. Robson, for more provisions.

On Wednesday, July 28th, we again climbed the cliffs of the north shoulder, but made our "Higher Up" camp that night, in the cliffs above the shale slope at 10,000 feet above the sea. Here we slept on a little ledge so narrow that there was only room for the two of us to lie close together, and we had to build a little wall of stone, to keep us from rolling off the mountain-side.

Though the weather was fine that night, we were very cold, and the wind, at that altitude, was terrific. All the peaks for hundreds of miles were below our level, excepting Mt. Turner on the north, a fine 12,000 foot peak on the other side of the "Valley of a Thousand Falls" from us. The grinding avalanches and the distant roar of countless water-falls, sang our lullaby. We had carried some dry wood with us and were able to warm over a stew of wild meat for breakfast; then in the crisp early morning of July 29th, we tried for a second time those rugged walls of the northern face of Mt. Robson.

So successful were we, that by 9:30 A. M. we had reached an altitude of 11,000 feet where we came to an unscalable wall of rock. Our only possible way to circumvent it was up a slope of ice, 60° or 70° from the horizontal. The ice terminated in a jagged crack in the wall, where we had to climb some 25 feet straight up in the air. It took us so long to cut steps up that great slope of ice, and the ravine was so difficult that it was noon before we conquered them.

But above, we found every possible lodging place loaded with snow, making our climb not only more difficult but adding danger as

well. The sun swinging round to the west brought a new enemy. The snow on the sheltered cliffs began to melt making our footing on them exceedingly treacherous; and not only were little streams forming in every draw and couloir, but loosened masses of rock and ice began falling on every hand.

We reached an altitude of over 12,000 feet, and our worse difficulties seemed nearly over, but the day was too far spent for us to make the peak and ever get back to safety, so reluctantly we turned back.

For more than 1,000 feet down those upper cliffs of rock our every step was fraught with fearful danger. Not only did we have to descend gullies dripping and streaming with water, where falling rock and avalanche were a constant menace, but the now melting masses, that covered every ledge, threatened to slide from under our weight and drag us over the cliffs. We found that the steps we had cut in the ice slope of the couloir below, had nearly melted away, and the whole mass looked as if it would slip down over the cliff if we so much as touched it. But it was our only possible way down, and we had to hurry for each moment added to our dangers. We made a cairn at 11,500 feet. After we got below the snowline, we made good time, for Phillips was fast becoming expert in mountaineering.

Reaching the level of the big west shoulder, up which I had climbed in 1908 in a blizzard, I left Phillips in charge of my camera, and for half a mile followed the narrow ledges, till I stood on the summit of that noble view point. The sun was just setting, Phillips was a mere dot on a cliff to the north, the lake that Dr. Coleman named after me, and the "Valley of a Thousand Falls" lay 8,000 feet directly below.

These and the valley of the Fraser, with its little thread of silver, were being engulfed with darkening blues and indigos as twilight flooded the innumerable peaks and glaciers on every hand. But above me swept a long slope of snow clear to Mt. Robson's highest pinnacle. Though tipped at a fearfully steep angle and with bands of black across its white spoke of cliffs to climb, the contrast it presented to the almost perpendicular cliffs we had been climbing during the past four days, filled me, for the first time, with joy and confidence of ultimate success.

I hurried back to Phillips and told him the good news, and we determined to make the top of that west shoulder our "Highest Up" camp the next day.

But this little side trip had delayed us considerably. We had planned to enjoy a real supper and to sleep comfortably that night in Camp Robson at the foot of the mountain. In fact we had to cut steps in the ice of those steep couloirs and get down the last 500 feet of cliffs in the dark of night, before we reached our "Higher Up" camp in the cliffs.

There was nothing left for us to do but camp there again at 10,000 feet altitude, in the wind and cold, on that narrow ledge. I started a little fire and warmed up our stock of stew, while Phillips made our bed. There, partly covered under our blankets, we ate our supper in the dark and watched the gathering storm-clouds blot out the white-capped peaks at our feet.

The storm soon swooped down upon us burying our little world in white, while the tempest of wind threatened to tear the very cliffs to pieces. I do not suppose there is any place where the wind can blow so hard as on an exposed mountain top.

Phillips and I curled up so closely together that we managed to keep from freezing, though it was a most uncomfortable night.

By daylight it was storming as hard as ever. The rocks that had been warm in the sun of the day before, still retained enough heat to melt some of the snow that fell, so by morning the drip from the cliffs had wet our blankets through, and we were driven to seek Camp Robson, at the foot of the mountain several thousand feet below. Packing up our wet blankets and without any breakfast, for we could not start a fire and we were too cold to eat, we plunged through the storm and glissaded down a long slide of snow. A thousand feet below where we had slept, we got below the storm, and in a couple of hours had got down the cliffs of the north shoulder, and were once more comfortably feeding at our camp fire at the base of the mountain.

For eleven days it stormed on Mt. Robson, so that it was folly to attempt to climb it. We cooked the last of our flour, and our sugar and other necessities disappeared. Yet we had to be in good shape for the final climb, if the weather would only clear up. For eleven days we roamed that country from valley to storm-swept peaks, hunting for game that we might live.

At last the weather began to clear up, and Monday Aug. 9, we climbed again that rugged north shoulder. Crossing the difficult shale slope, we passed the camp spots of our former trips, and with our heavy fifty-pound packs, struggled up those fearful cliffs till we

reached an altitude of nearly 10,500 feet. We would soon have reached the top of the west shoulder, when a storm caught us. For a couple of hours we had watched the storm-clouds gather, then gradually obliterate the peaks; yet we pushed on, hoping they were only squally.

We were climbing in a narrow *col* when it began to snow. We did not mind it at first, but in a few minutes it had snowed three inches, and slides began to come down. Realizing at once our danger, we hastily cached our packs under a sheltering rock and



FIG. 3.—CAMP "HIGHER UP."

Here Kinney and Phillips slept two nights at an altitude of over 10,000 feet. They built a wall of rock to keep them from rolling off the narrow ledge down the mountain.

hurried down those cliffs. But we had a bad half-hour before we got out of danger and glissaded the draw down the long shale slope. We got down to camp Robson at the foot of the mountain in a discouraged frame of mind, for we were hundreds of miles from civilization, with scarcely any provisions, and the mountain was still unscaled.

For three days it stormed, and we lived on birds and marmot (a kind of mountain ground-hog). Then Thursday, Aug. 12th, dawned fine and clear. As we had lots of time to make our "Highest Up"

camp that day, we spent most of the morning repairing our boots and clothing and making ready for our final climb. After an early dinner, we climbed the several thousand feet of cliff to where we had cached our packs the Monday the storm caught us. Shouldering our packs, we climbed more cliffs, and finally worked our way to the top of the west shoulder, 10,500 feet above the sea. Here at an altitude equal to that of Mt. Stephen, we chopped away a couple of feet of snow and ice, and feathered our bed with dry slate stones. We shivered over the little fire that warmed our stew, and then amid earth's grandest scenes, we went to bed with the sun and shivered through a wretched night.

Friday, Aug. 13th, dawned cold and clear, but with the clouds gathering in the south. Using our blankets for a wind-brake we made a fire with a handful of sticks, and nearly froze as we ate out of the pot of boiling stew on the little fire. Then we placed stones on our blankets so they would not blow away, and facing the icy wind from the south, started up that west side of the upper part of the peak.

The snow was in the finest climbing condition, and the rock-work though steep offered good going. Rapidly working our way to the south, and crossing several ridges, we had reached, in an hour, the first of two long cliffs that formed horizontal ramparts all around the peak. We lost half an hour getting up this cliff, but finally found an easy way.

But the clouds that came up with a strong south wind, had gradually obscured the peak, till at the cliff, they were swirling by us on our level, and at the top of the cliffs it began to snow. For a moment I stood silent, and then turning to my companion said: "Curly my heart is broken." For a storm on the peak meant avalanches on that fearful slope, and there would be no escaping them. So I thought that we would have to turn back. Our provisions were now so low that we would not have enough to make another two-day trip up the mountain. So it meant that this was our last chance.

But to my surprise it did not snow much, the clouds being mostly a dense mist. In a few minutes I said, "Let us make a rush for the little peak," meaning the north edge of the peak which was directly above us.

"All right," said Curly, from whom I never heard a word of discouragement. And away we started, keeping to the hard snow slopes. Though these were extremely steep, the snow was in such

splendid condition that we could just stick our toes in and climb right up hand over hand.

By the time we had conquered the second of the long ramparts of cliffs, that form black threads across the white of the peak, we concluded that it was not going to snow very hard, as the clouds were mostly mist and sleet.

Swinging again toward the south, we headed directly for the highest point of the mountain, which we could see now and then through the clouds. Small traverse cliffs of rock were constantly



FIG. 4.—THE BIG GLACIER.

The Glacier is on the east side of Mt. Robson. The view was taken from a peak several miles away. This fine ice river is a mile wide and five miles long. It marks the boundary between the Provinces of Alberta and British Columbia.

encountered, but they were so broken up that we could easily get by them, by keeping to the snow of the little draws.

For hours we steadily climbed those dreadful slopes. So fearfully steep were they that we climbed for hundreds of feet, where, standing erect in my foot-holds, the surface of the slopes were not more than a foot and a half from my face; while the average angle must have been over 60° . There were no places where we could rest. Every few minutes we would make foot-holds in the snow

large enough to enable us to stand on our heels as well as our toes, or we would distribute our weight on toe and hand-holds, and rest by lying up against that wall of snow; for on all that upper climb we did nearly all our work on our toes and hands only.

The clouds were a blessing in a way, for they shut out the view of the fearful depths below us. A single slip any time during that day meant a slide to death. At times the storm was so thick that we could see but a few yards, and the sleet would cut our faces and nearly blind us. Our clothes and hair were one frozen mass of snow and ice.

When within 500 feet of the top, we encountered a number of cliffs, covered with overhanging masses of snow, that were almost impossible to negotiate, and the snow at that altitude was so dry that it would crumble to powder and offer poor footing. We got in several difficult places that were hard to overcome, but we finally fought our way up the last cliffs, only to find an almost insurmountable difficulty. The prevailing winds being from the west and south, the snow, driven by the fierce gales, had built out against the wind in fantastic masses of crystal, forming huge cornices all along the peak, that can easily be distinguished from the mouth of the Grand Forks some ten miles away. We finally floundered through those treacherous masses and stood at last on the very summit of Mt. Robson.

I was astonished to find myself looking into a gulf right before me. Telling Phillips to anchor himself well, for he was still below me, I struck the edge of the snow with the staff of my ice axe and it cut through to my very feet, and through that little gap at my feet, that I had made in the cornice, I was looking down a sheer wall of precipice that reached to the glacier at the foot of Berg Lake, thousands of feet below. I was on a needle peak that rose so abruptly that even cornices cannot build out very far out on it. Bearing my head I said: "In the name of Almighty God, by whose strength I have climbed here, I capture this peak Mt. Robson for my own country, and for the Alpine Club of Canada." Then just as Phillips and I congratulated each other, the sun came out for a minute or two, and through the rifts in the clouds, the valleys about us showed their fearful depths. The Fraser lay a thread of silver, over 11,000 feet below us. Before I could take any photos the clouds shut in again thicker than ever.

"We were nearly frozen, so we could not remain at the top till the

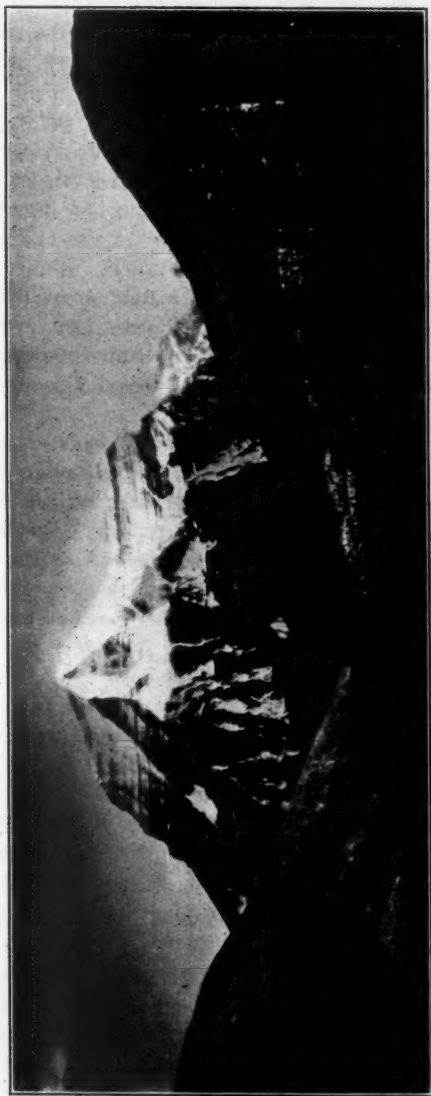


FIG. 5.—MT. ROBSON.

As the tourist on the Grand Trunk Pacific R.R. will see it from the car windows. Taken from the mouth of the Grand Forks, eight or ten miles away.

clouds should break. We could not build a cairn there, in which to cache the Canadian flag that Mrs. Dr. George Anderson of Calgary had donated, and our records, for if we left them in the snow they would have been lost; so we cached them on our return, in a splendid natural cairn, a few hundred feet below the peak."

On three different little cliffs near the peak, we met with great difficulties in getting down, but we finally managed. After caching our cairn and getting down near the 12,000 foot level, we found a new danger that nearly finished us. The storm had increased but the temperature had risen.

In fact a chinook was melting the lower snows. We found our trail nearly melted away. To make the matter worse, the slopes were so steep that the snow never could lie very deep, even in the couloirs; and we frequently had to make detours around places, where the ice or rock beneath the thin snow, would allow of no footholds whatever.

It was so cold and stormy at the peak, we did not get anything out of our packs to eat. While I fixed the cairn, Phillips ate some chocolate, and, later, I snatched a moment to eat some, paper and all. But during the twelve hours climbing and returning on that slope, there was no time to do anything but get to the peak and then to safety. So very dangerous did the snow get, that our return trip cost us seven hours of distressing work, while the climb to the peak was made from our "Highest Up" camp at 10,500 feet in five hours. We had to use the rope all the way down, and only one of us could move at a time, while the other got as good an anchorage as possible. But finally we reached the lower of the two bands of cliffs where we unroped, and then rapidly got down to camp "Higher Up," where we soon devoured everything edible in sight.

The storm was raging fiercely above us, night was gathering, and we had thousands of feet of cliff still to climb down, before reaching Camp Robson that night. Yet we lingered on that West shoulder, eating and resting, and oh so glad that the peak had at last really been won.

It was a long three hour struggle with our packs down those cliffs. We had half a mile or more of ledges to follow to the north, there were several deep gorges with ice steps to cross, then a long glissade and more cliffs. So it was long after dark before we reached Camp Robson. We finished the return trip from peak to base in twenty hours. We were so tired we could hardly eat or

rest and our feet were very sore from making toe-holds in the hard snow.

But we had stood on the peak of Mt. Robson, and the struggle had been a desperate one. Three times we had made two-day climbs up Mt. Robson, spending ninety-six hours in all, above 10,000 feet altitude, so far north. During the twenty days we were at Camp Robson we captured five virgin peaks, including Mt. Robson, and made twenty-three big climbs.

I had now only one horse left, for the other one that I had brought in had caught swamp fever on the trail and now his bones bleach under the cliffs of the north shoulder of Mt. Robson. We caught our horse the next day, and with many a backward look at the conquered peak glistening in a clear sky, we left that scene of so many battles and still wondered at our victory. For days we had to live on what gophers and birds we could get, for we were out of other provisions.

On the Athabasca we met the members of the British Alpine party going in to the mountain, and received their hearty congratulations. Unfortunately weather conditions prevented these courageous men from also capturing the peak.

Others will doubtless some day stand on Mt. Robson's lonely peak; but they who conquer its rugged crags, will ever after cherish in their hearts a due respect and veneration for its mighty solitudes.

AN UNKNOWN FIELD IN AMERICAN ARCHÆOLOGY

BY

HARLAN I. SMITH

The unknown field in North American archæology is far greater in area than the known field. Nothing is understood of the life of the prehistoric people, the direction from which they came, or when they arrived, in a portion of the United States and Canada larger than all the rest of those countries. This area stretches from the Gulf of Mexico to the Arctic Ocean and occupies most of the country between the Mississippi valley and the Coast Range. It includes the Mackenzie basin, the Barren Lands and the great plains. In

the United States, eastern Washington, Oregon, and California, all of Idaho, Montana, Wyoming and Nevada, northern Utah and Colorado, all of Texas but the eastern edge, most of Oklahoma, Kansas, and Nebraska and the western part of the Dakotas belong to this region which we may popularly term darkest archæological America.

Remains indicating the presence of man in America at the close of the glacial period or other very early times have been reported from various places in the country, but none of them is as yet fully established to the satisfaction of all archæologists. Near Trenton, N. J., many rudely chipped stone objects which have been termed "palæolithic implements" and bones of animals no longer native to the temperate regions (as well as of man), which were thought to bear marks of human handiwork, have been found in what was supposed to be undisturbed glacial deposits.

Among several reported finds in Ohio I may mention similar "palæolithic implements" reported by Mills and Metz. Such stones were reported by Cresson from Indiana and by Miss Babbitt from Minnesota. The human bones found at Lansing, Kansas, and near Omaha, Nebraska, known respectively as the "Lansing Man" and the "Nebraska Man" are not yet accepted by all, but are considered as probably of comparatively recent Indians.

A human figurine, said to have been taken from an artesian well in Idaho, for a time excited attention. The "Calaveras Skull," a human skull found in a cave in Calaveras Co., Cal., for years was considered as conclusive evidence of the great antiquity of man. Bones, some of which are thought to have been carved, associated with remains of extinct animals in another cave in California have been examined by St. Clair and Putnam.

Archæologists as a class may be said to await proof of the great antiquity of man in America. Consequently as all these reports, with the exception of that of the Idaho image, came from the smaller or archæologically known part of the country and they all together have not established the question, there is all the more reason to desire information from the larger or unknown part of North America.

When this vast region was first visited by white people it was found to be inhabited by certain Indian tribes whose languages differed as much from one another as French from Spanish, and between some of the languages there was the same affiliation as we find between these tongues. Students have come to group them

into linguistic stocks, just as those two European languages are grouped under the Aryan stock. The languages of one stock differ from those of another, just as the Spanish does from Turkish. It so happens that this area includes part of the territory inhabited by the tribes of the Algonquian and Caddoan linguistic stocks, and all of the country of the Kiowan and Kitunahan linguistic stocks. But the Athapaskan, Siouan and Shoshonian peoples occupied the greater part of the area and it is also true that the greater part of their country lay within the borders of this unknown territory. To know the early history of these great groups of entirely different peoples we must know the archaeology of that part of the country.

As there were differences in language so there were differences in life or material culture. This was partly due to the effect of environment. There are among these cultures those of the eastern forest, the Arctic seacoast, the Barren Lands, the plateaus, the plains and the arid southwest. Part of these areas are included in the unknown region, while all here mentioned extend into it. A knowledge of how the cultures within the unknown area developed can only be obtained by archaeological explorations, and to know the limits of the other cultures above mentioned it will be necessary to prospect out into the unknown region.

The plains which may be considered the nucleus of the unknown territory may hold the key to the whole situation. In historic times they have been inhabited by nomadic peoples. Tribes of the eastern forest culture, such as the Blackfeet, have migrated into them and become nomadic.

In the early days the peoples of the plains had only the dog as a domesticated beast of burden and draft. True, the horse developed from a little five toed creature to a splendid animal somewhat resembling our modern horse in this area, but, according to present scientific belief, he became extinct before man appeared in this country. When the white people first saw the Indians of the plains they had great numbers of horses and may be said to have had a horse culture. But these horses they obtained overland in one way or another, after the Spaniards had brought this animal to America. The horse must have greatly effected their culture, allowing them to travel farther, hunt the buffalo with greater success, migrate more easily and obtain and transport more property. The story of how these people lived before they had horses and the history of the change from a culture where they had only the dog, to one almost

dependent on the horse cannot be fully known without archaeological research in the great plains.

The plains formerly supported immense herds of buffalo. It is said that there were more buffalo killed on the plains in ten years than there are people in England. Now they are found only in public or private parks, and a society has been formed to prevent their extinction. The culture of the plains people depended perhaps even more upon the buffalo than it did upon the dog or horse. Zoologists have determined the former range of the buffalo and it will be of considerable interest and importance to ascertain whether or not the culture of the buffalo area was of one sort throughout, due to this animal and if the culture immediately outside of the buffalo area was of an entirely different sort.

Corn was raised throughout the eastern part of the United States and Canada as far north as the climate would permit and for some distance westward out on the plains. Curiously enough pottery is found to have been made wherever corn was raised in the United States. This territory also includes the irrigated fields of the desert region of the southwest. On the other hand no pottery is found in British Columbia, Washington, Oregon and the vast bordering region. The unknown archaeological area lying between this Pacific coast country and the regions where corn and pottery were abundant, of course, holds the key to the limits of the territory where the potter's art was known in this part of the world.

The material culture of the country to the east of this vast neglected area is fairly well known. Immediately adjacent in the great Mississippi valley was a sedentary agricultural people who also depended upon certain wild plant products and largely upon game and fish.

The archaeology of the eastern region in general is characterized by many well known objects.

The prehistoric culture of the Cliff Dwelling and Pueblo area of the southwest is also well known, although our knowledge of it has been gained chiefly during the past thirty years. Even though a desert country, its culture was agricultural and its people even more sedentary than some of those in the Mississippi valley. It may be said to be characterized by flat topped stone and adobe buildings, the best pottery found north of Mexico and irrigation projects.

To the west, the culture of the Santa Barbara region of California is well represented in our museums.

Northwest of the unknown region are the plateaus of British Columbia and Washington, the native culture of which we know. Here the people depended upon many resources, lived in small villages composed of individual houses and depended chiefly upon hunting and fishing for subsistence.

The part of the vast unknown archaeological area which interests us most, is that which lies in our own country, partly from patriotic reasons and partly because the colder northern region would seem to promise meager results and even more extensive stretches between the sites of antiquities than are found in the plains.

Wyoming, near the center of that part of the unknown region lying in the United States, includes the head waters of the Snake, which passes through the northwest plateau country; the Colorado, which cuts through the Pueblo region, and the Platte, whose waters descend to the Mississippi valley. If the three cultures found lower down in these valleys occupied the entire drainage basin of each, Wyoming would certainly hold the key to the problem, and it was partly for this reason that I selected the south and east part of that State for the field of my first trips of reconnoissance into the great unknown archaeological area. These trips were made under the auspices of the American Museum of Natural History in 1907 and 1908.

While Wyoming is not the largest of the States in the unknown area and is a mere speck compared with the whole, if superimposed on a part of the Middle Atlantic states where thousands of dollars and years of effort have been spent in archaeological research, we find that it is larger than Massachusetts, Rhode Island, Connecticut, and New Jersey, parts of New Hampshire, Vermont, New York, Pennsylvania, Maryland and Delaware, with a goodly portion of the Atlantic ocean thrown in. So it would seem that if New Jersey or Connecticut both deserved extensive exploration, this larger State had been neglected long enough.

My route in 1907 lay along the line of the Chicago and Northwestern R.R. from east to west across the middle of the State. This was in the Platte valley and with the railroad as a base, side trips were made on foot, with saddle horses and with mountain wagons. From the western terminus of the railroad the route lay across the continental divide, through the Red Desert, southwestward to the Union Pacific Railroad. From here horses took us to various points up and down the Green River valley and the railroad was again

used as a base in recrossing the State parallel to, but further south than our former route. In 1908 I went by wagon from Raw Hide Buttes to the Black Hills. Then westward to the Big Horn Mountains and southwest to Casper; thus circling the northeastern part of the State.

The southern and eastern parts of Wyoming are an arid, rolling country, cut by many cañons, most of which are dry and are practically treeless, except for willows and cottonwoods in some of the bottomlands, or pines and cedars on a few of the hills. The cowboy well describes it by saying:

"There are more cows and less butter, more creeks and less water, and you can see farther and see less than in any other part of the country."

The results of our expeditions include the discovery of a new form of steatite pot, quite as different from the type found on the Atlantic seaboard as from those of California; several boxes of specimens; over a gross of photographs showing the country, and its antiquities; and a knowledge of the distribution of archaeological forms and sites.

The chief antiquities of the region consist of hundreds of circles of stones marking ancient lodge sites, principally in the east; prehistoric quarries, some of them covering acres in the east and petroglyphs especially in the north and west. The circles of stone instead of being in the river bottoms, as are the village sites of the Mississippi valley, are usually on high ridges but near a stream or spring. Sometimes a single circle is seen, again there are whole villages indicated by them. There is nothing to prove the age of these circles except that most, if not all, of the stones are sunk some distance into the soil. The modern Blackfeet, living in Montana, use stones to hold down the edges of their tipis, while the Shoshone, in western Wyoming, as a rule, do not. This may account for the scarcity of stone tipis circles in western Wyoming. An occasional saucer-shaped depression in the earth, probably also a mark of tipis sites of a people with practices like the modern Shoshone, was also seen.

The quarries, each of which covered several acres, were found in many places in the Platte valley. Those locally known as the "Spanish Diggings" because once attributed to early Spanish gold miners, have been known for some time, but others are new to science. The quarries are marked by pits dug down through the earth to get the quartzite and jasper desired as material for chipping

into points for arrows, scrapers, knives and possibly other forms of implements. Arrow points are found scattered over the whole country and sheep herders amuse themselves by collecting them, while scrapers are very numerous among tipis circles. Lying about the pits are, occasionally, river pebbles which have been battered from use as hammers in the quarrying operations. Some of them have grooves pecked around the middle where a handle could have been bound on. One of these was photographed before it was picked up from the ground where it lay among the quarry refuse, broken out by it or by similar pebbles. Such pebbles are not found scattered about over this quarry country and must have been brought some distance from the river valleys. At each quarry are actually train loads of rock which have been broken out by these stone hammers and from most of it has been trimmed the poorer material which would not do for the making of implements. In this trimming process there have been left carloads of almond-shaped pieces from four to twelve inches in length, chipped in such a way that they have a cutting edge all around and if any of the poorer rock remains it is in the middle of the flat sides. These are the natural results of the best way which primitive people have of chipping the poor material from a block of rock. They resemble "paleolithic implements," but their surfaces do not bear as much patina, that is, they are not so much decayed or weathered. They also resemble unfinished implements, such as are found among the quarry rejects of the eastern United States, but they are probably either pieces of rock suitable for the making of implements which have assumed this form in the process of freeing them from the unsuitable rock, or they may be cores from which first the unsuitable rock has been chipped and then many chips have been taken off for transportation to the home of the quarryman.

That the rock was not extensively worked into chipped implements at the quarries is indicated by the scarcity of small flakes and finished implements in their vicinity. The scrapers in the tipis circles are about the only finished implements commonly found and this is probably because the women were busy tanning the skins of antelope and buffalo, animals formerly numerous here, while the men were occupied at the quarries. The vicinity is so desolate and water so scarce that when not engaged in quarrying or hunting these animals the people probably lived elsewhere. There is no great accumulation of village refuse to indicate long habitation near the quarries.

The antiquity of these quarries goes back to times before historic record in this region, which began about a century ago. The absence of objects made by white people, such as implements of iron or glass beads, shows that it was before the Indians had much contact with our people, but nothing has thus far been found to indicate their remote antiquity.

A fragment of an arrow shaft smoother was found near Lusk, in the eastern part of the State. It will be remembered that these are common in the northwest plateau region, the Pueblo country, and have been found in Nebraska, so that we might expect to find them among antiquities in this middle region, especially since some of the modern Indians here have used them.

Large flat grindstones or lower handmills with small grinders or upper handmills, like the metates of the Pueblo country, are found through southern Wyoming, but are perhaps more numerous in the western part which is in the same drainage basin as the Pueblos. They certainly remind one of the Pueblo culture, and this type of them is unknown in America north of southern Wyoming.

The historic plains tribes customarily boiled their food by dropping hot stones into a buffalo paunch containing it. But the fact that they also used stone pots accounts satisfactorily for the numbers which we saw. As before mentioned, they are of a shape new to science, unlike the trough-shaped dishes of the east and the globular ollas of California, some being of the form of an egg with the tip of the larger end removed, others of a steep truncated pyramid with rounded corners and bulging sides, while others are somewhat of the latter form, but longer than they are wide.

Pottery was not extensively made here, resort to paunch boiling or steatite pots no doubt taking its place. We found it only near Raw Hide Buttes on the trip and learned of its occurrence at only eight places. All these were in the southern part of the State. Some of the pottery which we saw somewhat resembles that of the Cliff Dwelling country immediately to the south. The northern limit of pottery in this longitude is probably marked by these eight finds. It will be remembered that pottery is not found farther north of this in any of the country to the west, except in a small region near the Yukon, which it may have reached from Siberia, but in the Mississippi valley it is found as far north as maize was planted and as far northwest as Mandan, Dakota.

One of the pieces of pottery is of especial interest. It is in the

possession of a druggist living at Douglas. It was found in a cave some miles south of that city and strongly reminds us of the coiled ware of the Pueblo country. Close examination, however, especially where it was broken and could be seen in cross section, convinced me that it had been molded in a basket. It is one of the two best examples of pottery made in a basket that I have seen. The top of the pot being smaller than the body, it could not have been taken out of the basket, which must have been burned in firing the jar.

A number of caves were seen both in the eastern and western parts of the State. Some in each region had been barricaded with poles, which had been preserved by the dry climate and appeared very ancient. They were lashed together with withes. In one of the caves in eastern Wyoming was a great accumulation of *débris*, and in front of it were tipis circles and more evidence of village *débris* than I saw elsewhere in the State. The top of the refuse in the cave was strewn with the bones of sheep and cattle, probably dragged there recently by wild animals. The presence of pictographs near the cave and of the unusual traces of habitation in front of it, led me to believe that the lower layers of cave refuse might contain human remains or manufactures, thus holding evidence for a knowledge of these Wyoming cave dwellers. For this reason I have recommended the caves as one of the more promising fields for future exploration.

A boulder mosaic, representing a human figure, many feet in length, as indicated by boulders placed on the ground, has been described by visitors to the "Spanish Diggings" country. Such figures are well known in Dakota.

Lines, some many miles in extent, are formed usually by single boulders or little piles of stones, although in one case the piles were rather large. These were found, in a number of places mostly in the eastern part of the State and their use has given rise to much speculation. Some consider them to mark boundary lines, others to indicate trails across the prairies, or guiding decoys for the capture of buffalo.

A few graves, covered with stones, have been found in Converse Co. and similar stone piles have been excavated but found to cover only bits of charcoal. Small piles of stone sometimes found in the center of tipis circles are scorched upon the lower side and are supposed to mark fire places.

A stone "fort," so called for want of a better name, was seen and

photographed on top of one of the Raw Hide Buttes. It consists of two walls of rock crossing a narrow defile on top of the butte, but whether this was made by prehistoric Indians or early white visitors to the region is unknown. A single wall or pile of rocks crosses the same defile at two points further along on the butte.

Petroglyphs are found in both the eastern and western parts of the State and pictographs, both red and black, occur in the Wind River country. We saw only one set of petroglyphs in the southeastern part of the State. These were near the cave previously mentioned. They were in the area formerly inhabited by Caddoan tribes. In the vicinity there lived the Arapahoes of the Algonkin stock who formerly inhabited the wooded area to the northeast. There were three of these representing human forms scratched in the red sandstone. They resemble in character the birch bark pictographs of eastern Algonkin forest tribes. In the western part of the State petroglyphs are of two kinds; one, pecked or bruised so as to make a fresh mark upon the surface of weathered basaltic rock, the other scratched and pecked intaglio in the sandstone. Some of the latter seem to be recently made, while some of the former appear very old. The first kind may be of Shoshonean origin; the second resemble in character the pictures painted on skins by recent plains tribes. The horse is frequently represented in the characteristic conventional style of the plains Indians and one picture of a buffalo is rather striking. The Arapaho, who adopted the prairie culture since their migration to the plains, were removed to this region by the United States government and now live side by side with Shoshones.

The eastern part of Wyoming seems to have been more thickly settled in primitive times than the middle or even the Green river valley of the western part. Signs of man, especially petroglyphs, are numerous in the Wind river country. The continental divide in the region of South Pass does not seem to be what would have been much of a barrier for primitive peoples. I have a suspicion that the remains in the eastern part of the State belong to the western parts of an ancient plains culture. Those in the west probably belong to a type of culture which came, transmitted over the continental divide, from the Pacific drainage.

The pottery and metates, found in the middle part of the State, seem to attest that Cliff Dwelling influence extended to this vicinity.

An archaeological reconnaissance across the northwestern part of

the State would do much to settle these questions, while an exploration of the caves in the east and the photographing of all the petroglyphs of which we heard in the west so that a comparative study could be made of them, would give us a more detailed understanding than can be had from a mere reconnaissance. One of the problems of most interest to ethnologists is whether the plains have been inhabited for any considerable number of years, say before the introduction of the modern horse. An exploration of the caves may throw light on this problem, but in all this work of determining the location, character and age of cultures there must be co-operation between archaeologists, geologists, linguists, ethnologists and students of mythology and tradition.

KORDOFAN

Kordofan is the large Province of the Anglo-Egyptian Sudan between the Nile and Darfur. Knowledge of this large region was quite imperfect until the British ended the régime of the Mahdi in 1899. Since that time the British have traversed the country in all directions and have made a map of a large part of the province on a scale of 1:250,000 which gives a very good idea of it, though the map is not based on triangulation.

Captain Watkiss Lloyd, recently governor of Kordofan, has an article on this large region in the *Geographical Journal* (March, 1910, pp. 249-267, map and illustrations), in which he contributes many new facts to our knowledge of Kordofan. The following data are taken from his paper:

The province includes about 130,000 square miles with an estimated population of about 500,000. It extends about 400 miles N. and S. and 350 miles E. and W. It is naturally divided into two parts, North and South Kordofan, the dividing line extending obliquely from lat. 12° N., on the frontier of Darfur, to lat. 13° N. on the White Nile.

North Kordofan consists of plains, generally sandy, formed by the disintegration of granite and sandstone hills and broken in the north by clusters of granite hills. North of lat. 14° 30' N., the plains are often stony and broken by many wadis, the streams losing themselves in the sand or forming small lakes that dry up after the

rains cease. The natives often work the salt that is left behind. The plains are either bare or covered by low bush that is thicker in the wadis. The real bush begins about lat 14° 30' N., where the country becomes more undulating. The rain usually sinks where it falls, there being no visible watershed. This district extends south to the dividing line between northern and southern Kordofan, and in it are most of the gum forests which are the chief wealth of the province.

Along the Nile is a belt of low ground, chiefly black soil, in places 12 miles wide, very fertile, broken by many watercourses and politically attached to the White Nile province. The country rises rapidly westward, becomes much more sandy, and, about 40 miles west of the Nile the rainless and almost treeless district of El Akaba begins, extending westward for 50 miles. This district is uninhabited except during the rains, when the population drive their flocks into it. The hills become higher and steeper to the west, till a level plain is entered near El Obeid, the chief town of Kordofan. To the north of this town is the district of El Kheiran, where the sandhills enclose a number of small basins with fertile soil, and water at depths of 4 to 10 feet, once highly cultivated, devastated by the Dervishes, but now rapidly recovering.

Around El Obeid, the soil is much less sandy, the wells are quite numerous, particularly in the town, and there are many villages. Thirty miles west of El Obeid begin the sandy, bush-covered steppes of Dar Hamar, extending to the Darfur frontier, about 170 miles.

Water is the chief topic in northern Kordofan. It is a mistake to regard the country west of Khartum as a waterless district, though there is not enough to support a large sedentary population. In the most of Dar Hamar, however, the people are dependent for water chiefly upon watermelons and the supply they store in the trunks of baobab trees. Melons are grown in enormous quantities and kept in heaps, protected from the sun, until needed. A hole is cut in the hollow trunk of the baobab tree and the cavity is filled with rainwater to be drawn upon as required.

Southern Kordofan is the home of the Baggara or cattle-owning Arabs and Nubas. This is a very different country, consisting of a plain of black soil, from the middle of which the rugged hills of Dar Nuba rise to a height of 3,000 feet. The rain does not sink where it falls, as in the north, but the country is drained by several considerable watercourses, filled during the rains, but dry a few weeks later. The country between the White Nile and Dar Nuba

is about 150 miles square, many of the hills being masses of huge granite rocks containing many caves and hiding places utilized by the Nubas in time of war. West of Dar Nuba, the plain extends to beyond the Darfur frontier and is covered with bush except where cleared for cultivation. The bush gradually changes to forest towards the south.

The drainage system of southern Kordofan is exceedingly simple. The Khor Abu Habil rises in the hills west of Dilling and flows N. E. to Sungikai, where it turns east, finally losing itself in the sandhills near Gedid. It is joined by many affluents from the south and there are good wells along its course. The climatic variations are considerable in Kordofan. The rains begin earlier, about March 15, in the south and end later in the north. The climate at El Obeid is pleasant from November to March, when the heat becomes oppressive, until the wind, turning to the south, about the end of April, brings the first rains. The wet season lasts till about the middle of October, when the wind goes around to the north. At El Obeid the rainfall seldom exceeds 25 inches. In the south, the rains are much heavier and last longer. Malaria is the chief cause of sickness, but the war on the mosquito is improving matters at the Government posts.

Arabs and Nubas form the population, the latter being confined to the hills of southern Kordofan. The Arabs are divided into camel-owners, sedentary tribes and Baggara or cattle-owners. The camel-owners live in the northern and drier part of Kordofan and also own many sheep, goats and a few horses. Most of them live in tents, do not till the soil and subsist on camels' milk and the grain they buy from settled tribes. The nomad Arabs always regard a tiller of the soil as inferior to them.

The sedentary tribes live between lat. 14° and 12° N. The Gawama tribe owns all the best gum forests and is the richest of these tribes. The sedentary tribes all live in villages which seldom contain more than sixty families. The only large towns are El Obeid, capital of the province (pop., 12,000), and Nahud, with 10,000 inhabitants, between El Obeid and Dar Fur. The chief trade of the capital is in grain, cattle, cotton cloth and gums. The trade of Nahud is mostly with Darfur, the town sending cottons and trade goods west in exchange for cattle and ivory.

Practically all the Arabs of southern Kordofan belong to Baggara or cattle owning tribes. They have a bad name on account of their cruelties under the Khalifa, but they are the most enterprising

people in the province, and many of the poorer men go to Khartum to work in the public service till they have money enough to buy some cattle and settle down in their own country.

The Nubas, all living in the southern hill country, have often been raided by the Baggara Arabs for slaves and cattle and were terribly harassed under the Dervish rule. Under the present régime, they are gradually settling down, though they raid one another, from time to time. They cultivate a great deal of land and have many cattle, sheep and goats.

The resources of Kordofan are considerable, but require time and population to develop them. All the main roads have now been cleared of bush, and a railroad is to be built from the Nile near Kosti to El Obeid, but at present all transport is by camels in the north and pack-bulls and donkeys in the south. The chief source of revenue is gum arabic, but, as yet, only a small part of the vast gum forests are being worked. The herds of camels and cattle are very important, but mineral resources are rather limited. Iron is plentiful and salt is found in considerable quantities. On the whole, Kordofan is fairly rich as countries go in Central Africa. The revenue is now about \$300,000 and the expenditures \$175,000, so that the province is paying its way and contributing its share to the central administration. It will be a generation or more before the enormous losses from battle and famine under the Mahdist despotism can be replaced, though there is now no tribe that cannot be described as fairly well off.

GEOGRAPHICAL RECORD

NORTH AMERICA

CALIFORNIA'S MINERAL OUTPUT IN 1909. Lewis E. Aubury, State Minerologist of California, informs the *Bulletin* that, subject to trifling alterations, the statistical mineral returns for the State, in 1909, exclusive of gold, silver and platinum, figures for which are being collected by the U. S. Census Bureau, will reach over \$61,324,000. The precious metals will bring the aggregate up to \$80,000,000 and probably more. The value of the total mineral production will exceed that of 1908 by about \$14,000,000. The value of the total output in 1907 was \$55,697,949; 1908, \$66,363,198; 1909, about \$80,000,000.

A large part of the advance of 1909 over 1908 was due to the increase in production and average price of petroleum. The output of petroleum in 1909 was 58,191,723 barrels valued at \$32,398,187. California, in 1908, led all the

States in petroleum production. Here are the quantities and values of the leading mineral products of California excepting gold, silver and platinum in 1909:

	QUANTITY.	VALUE.		QUANTITY.	VALUE.
Asphalt	136,664 tons	\$1,707,159	Macadam	3,567,120 tons	\$1,636,125
Borax	33,257,000 lbs.	1,163,960	Marble	79,600 cu. ft.	238,400
Cement	3,779,502 bbls.	4,954,210	Mineral Water...	2,419,834 gallons	462,488
Brick	333,846 M.	3,059,929	Natural Gas	1,147,502 M. cu. ft.	616,447
Clay (Pottery)...	299,424 tons	460,697	Pyrites	457,867 tons	1,389,802
Coal	49,389 tons	216,913	Petroleum	58,191,723 bbls.	32,398,187
Copper	64,841,654 lbs.	8,283,202	Quicksilver	16,174 flasks	771,657
Granite	358,008 cu. ft.	376,834	Rubble	1,948,658 tons	1,063,809
Lime	520,752 bbls.	577,824	Salt	124,110 tons	339,671
Limestone	337,676 tons	419,921			

SOUTH AMERICA

THE TRANS-CONTINENTAL RAILROAD IN SOUTH AMERICA. The first railroad crossing the continent of South America was completed on April 2nd last and, three days later, was opened to general traffic. It connects Buenos Aires and Valparaiso, the track passing through the Cumbre Pass of the Andes, a defile extending between Mts. Aconcagua and Juncal, at an elevation of 10,600 feet above the sea. On the Argentine side, the most serious engineering work was the approach to Cumbre Pass, the grade up the mountain sides being so steep that the Abt system of cogs and racks was introduced for the safe movement of trains which also pass through a number of very costly tunnels on the way to the summit grade. A wagon road was completed through the Cumbre Pass in 1902, but the culminating difficulties of joining the rail routes that slowly approached one another on the Argentine and Chilean sides were not surmounted until this year. The final stages of the work, however, were carried forward with unexpected rapidity. It was said by the engineers, last year, that the road would be opened, from sea to sea in June, 1910, but the opening really occurred two months earlier.

The difficulties in the mountain section were even greater on the Chilean side, and were especially centered in the digging of a tunnel, 16,613 feet long which has, for several years, delayed the completion of the road. To reach the summit of the railroad, passengers and freight from Valparaiso are now lifted to a height of 10,600 feet above the sea, though the distance from the port to the summit is only a little over 100 miles.

Whether or not the complete efficiency of the road as a freight carrier will be impaired by the fact that the cog and rack system was necessarily introduced on short parts of the line, the value of the road, both to Argentina and Chile will be very great. This rail line, 887 miles long, between the largest Atlantic and the largest Pacific port of South America, will practically put an end to the passenger traffic between these ports through the Strait of Magellan, 3,224 miles, or by way of the still longer route of Cape Horn. Most of the commercial exchanges between Argentina and Chile will probably be made by the rail route and it will be a great advantage to the latter republic that the wheat fields of Argentina are brought much nearer to her.

A NEW PORT IN ARGENTINA. The problem of adequate harborage in Argentina is paramount in the development of its commerce. Buenos Aires has been

extensively improved, the channel to Rosario has been dredged almost continuously for the past decade and a half, Bahia Blanca has been made into a fair port with good hope of becoming a first-class port, and still commercial outlets are required. A new venture, and a most promising one, is now before us. On the north side of Samborombon Bay, near Punta de las Piedras, on the S. side of the Rio de la Plata, "Puerto Argentino" is to be constructed. It is to be completed in five years and will be a deep-sea harbor allowing boats drawing 30 feet to enter at ordinary low tide. (Con. and Trade Rep., July 11, 1910, No. 10.) It is to be built by the Port Argentine Great Railways Company, capitalized at nearly \$60,000,000. The total length of the entrance channel will be nearly 50,000 feet and not less than \$15,572,000 must be spent upon it; the docks will be 1,640 feet apart, 3,215 feet long and 1,050 feet wide, with a storage capacity of 100,000 tons which represents a movement of 800,000 tons a year. Goods will be transferred directly from ship to railway car. The motive power will be electricity. A model city will be built around the port with hotels, bathing beach, etc. In addition a dry dock will be built of sufficient size to accommodate the two new Dreadnoughts now being built for the Argentine navy in the United States. Dredges will at once begin work on the project and it is safe to say that in a few years the port will be in running order, for it is one of the most crying needs of commercial Argentina to-day. ISAIAH BOWMAN.

AFRICA

THE FRENCH IN WADAI. The French forces that have, for some time, been extending their occupancy and surveys in the central Sudan, have been considerably embarrassed by the opposition of the Sultanate of Wadai, a large territory, on the border of the Sahara, to the east of Lake Chad. Some of the French parties, not far from the Wadai border, were attacked by the natives. The French Government finally decided to occupy the Sultanate. In June last year, the French succeeded, with little difficulty, in taking possession of Abesher, the capital of Wadai, and no serious reverse was suffered till January last when Captain Fiegenschuh, who had commanded the operations in Wadai and established a garrison at Abesher, was attacked by an overwhelming force at the Taul wells, in the territory of the Messalit tribe, and he, with two officers and 100 Senegalese soldiers, were killed to a man.

In other parts of Wadai, according to *L'Afrique française*, the French have met with little opposition. Lieut. Delacommune reports that, seven weeks after the occupancy of Abesher, he started from the capital with a small force and made a journey throughout the Sultanate, finding the conditions everywhere peaceful; and although the people were afraid of him, for this was their first meeting with a white man, they evinced a desire to be on friendly terms with the new régime. He says he passed through a very fertile country where large villages were thickly sprinkled and great fields of grain and fine herds of cattle were everywhere seen. The French have taken large quantities of firearms from the natives.

Apparently, most of the people of Wadai living under the rule of their Sultan Dudmurra, are better than the reputation the French had given them; but such a catastrophe as that of January last is not a surprising incident in the

course of operations to bring a large and strong people under subjection to foreign rule.

LIEUT. BOYD ALEXANDER KILLED. Lieutenant Boyd Alexander, known for his important scientific explorations in Africa, was killed by natives in the Soudan, on April 2.

WIRELESS TELEGRAPHY AT ZANZIBAR. Zanzibar has long felt the inconvenience of having no means of quick communications with the island of Pemba, about 70 miles to the north of the port of the larger island. This is due to the fact that Pemba is the largest source of the world's supply of cloves and the business of cultivating and marketing the spice is carried on entirely from Zanzibar. Some years ago, an attempt was made to establish a carrier pigeon service between the two islands but the hoped-for results were not realized. In December, 1907, the Lodge-Muirhead system of wireless telegraphy was installed, the stations being erected near the port of Zanzibar and Chake-Chake, the chief town of Pemba. The experiment has been very successful and the interests of the clove trade are being well served by the wireless system. The men engaged in the raising and marketing of cloves say they are glad to support the service for the advantages it gives them. (*Globus*, Vol. 97, p. 179, 1910.)

AUSTRALASIA AND OCEANIA

PIGMIES IN NEW GUINEA. The London *Times* (Weekly Edition, June 10, 1910), reports that the committee appointed by the British Ornithologists' Union to explore the snow mountains in Dutch New Guinea has reached its field of inquiries and has sent the information that, at an elevation of 2,000 feet, it discovered a tribe of pigmies, in the far interior of the island, whose average height is about 4 ft. 3 in. More definite details have not been received but there can be little doubt that they belong to the Negrito family. Anthropologists had widely accepted the view that the Negritos were not to be found in the Papuan sub-region, but their occurrence there now seems to be proven and the present discovery is likely to account for the presence of various anomalous races in the remoter parts of the Lesser Sunda Islands. Hitherto, these people have been known to inhabit only three widely separated regions—the Andaman Islands in the Bay of Bengal, the northern portion of the Malay Peninsula, where they are known as Semangs, and certain areas in the Philippine Islands, especially in the northern island of Luzon. Further details of this important discovery will be awaited with interest.

EDUCATIONAL GEOGRAPHY

GEOGRAPHY IN THE HIGHER SCHOOLS. According to Dr. Hermann Wagner's latest collection of data (*Geographischen Jahrbuch*, Vol. 32, 1909, pp. 439-446), there are 233 teachers of Geography in the higher schools of Europe and the other continents distributed among 131 institutions. As a university study, Geography is not yet a century old. Karl Ritter was the first professor of Geography, a chair being established in the University of Berlin in 1825 with this famous scholar as its occupant. In his "Methodik der Erdkunde" for 1842, J. E. Lüdde reported that in the summer semester of 1841, lectures on Geography had been given in the universities by Ritter in Berlin, Mendelssohn in Bonn, Fröbel in Zürich, Wappäus in Göttingen, Kutzen in Breslau, and Haug in

Tübingen. In 1871, about the same time that the new German Empire came into existence, chairs of Geography were established in nearly all the German Universities. In 1909, there were 54 teachers of Geography in 31 of the higher schools of Germany. All the German Universities, excepting those of Jena and Rostock, then maintained professorships of Geography. The study was fully represented also in the technical high schools of Aachen, Danzig, Darmstadt, Dresden, Munich, Stuttgart; the four commercial high schools of Berlin, Cologne, Frankfort on Main and Mannheim, the academy in Posen and the new Colonial Institute in Hamburg.

Next to Germany, the largest number of teachers of advanced Geography are found in Austria-Hungary, Switzerland, France, Italy, Belgium, Great Britain and Russia. The only European states without them are Greece and Turkey. In Great Britain, geographical progress has been marked, in recent years, and in 1909 there were chairs of Geography in Edinburgh, Glasgow, Sheffield and Aberystwyth, Wales. [Oxford now has a professorship of Geography.] "In the United States, the teaching of Physical Geography is in the hands of the Geologists and Geography, as such, has been assigned, only to a very small extent, to the care of specialists."

POLAR

COAL PRODUCTION IN SPITZBERGEN. The British Vice-Consul at Bergen, Norway, reports (*Bd. of Trade Jour.*, No. 707 June 10, 1910), that the Trondhjem-American Coal Co., otherwise known as the Arctic Coal Company, mined 7,500 tons of coal last winter. Work was directed, however, not so much to obtaining coal as to pushing the works beyond reach of the frost, and the main level is now about a half mile long. Work, this summer, is to be devoted entirely to the installation of machinery and regular coal mining will begin in October next. The production of coal, next summer, is expected to be 50,000-60,000 tons, all of which will be sent to Norway. The manager says that the coal is of excellent quality and that it may be mined at a small but reasonable profit.

DR. CHARCOT'S ANTARCTIC EXPEDITION. Dr. Bruce has sent to the *Scottish Geographical Magazine* (June, 1910), some further information concerning the scientific observations of the Charcot expedition. A series of soundings seem to show that the continental plateau in the neighborhood of Graham Land has a very irregular surface while Peter I Land apparently rises very abruptly from the ocean depths. A shallowing in Lat. 70° S. and Long. 119° W. perhaps indicates the vicinity of land, while a sounding of over 5,000 meters in Lat. 66° S. and Long. 118° W. indicates the presence here of a deep depression of the ocean floor.

LIEUT. FILCHNER'S ANTARCTIC PLANS. The *Zeitschrift* of the Geographical Society of Berlin (1910, No. 3), reports on the aims of the projected German Antarctic Expedition as announced by its leader, Lieut. Filchner. He has planned the undertaking, on the theory that the Antarctic land mass may be found to be divided into two parts by an arm of the ocean connecting Ross Sea on the Pacific, with Weddell Sea on the Atlantic side of Antarctica. *Nature* (May 12, 1910), commenting on the idea, says that "this possibility, and also the view that the Antarctic land south of the Pacific consists only of an archipelago, must have occurred to all who carefully considered the results collected by the expeditions

of Captain Scott and Sir Ernest Shackleton. The meteorological evidence and the apparently well-marked westward trend of the land which drove Sir Ernest Shackleton upon the South Polar plateau seem, however, not very favorable to the idea of the direct connection of the Ross and Weddell Seas. Indications of any such connection might also have been expected from the tidal observations of the *Discovery*." It is hoped that this question, which Prof. Penck has declared to be much more important than the discovery of the pole, will be settled by Lieut. Filchner by direct observation. There seems little doubt that funds will be raised for his enterprise. One unnamed donor has given 300,000 marks.

PHYSICAL GEOGRAPHY

EVOLUTION AND OUTLOOK OF SEISMIC GEOLOGY. Prof. W. H. Hobbs has recently shown (*Proc. Amer. Phil. Soc.* Vol. XLVIII, 1909, 1-44) that the natural development of seismology was long retarded by Mallet's theory of the centrum. The tectonic conception of earthquakes began with Suess in 1872. Various studies of faulting associated with earthquakes have led to the establishment of the fault block theory. The great work of de Montessus de Ballore culminates this development. The relation of earthquakes to volcanoes has not been well defined until recent times, and the conditions of earth strain during the growth of block mountains is still under discussion.

The outlook in seismology "indicates two lines of effort to be followed up. These are (1) to make practical application of the knowledge already gained, and (2) to investigate with every possible improvement in method until we have so laid bare the law of seisms that we may forecast the time, the place, and the probable severity of future earthquakes with at least as much accuracy and forewarning as is now possible in weather prediction." Earthquake forecasts, earthquake-cycles, and possibilities of future prognostication are reviewed.

CLIMATOLOGICAL WORK OF THE WEATHER BUREAU. Some of the important problems in climatology which the Weather Bureau has under investigation are described by Professor F. H. Bigelow in the *Monthly Weather Review* for November, 1909. New charts of mean monthly and mean annual temperatures, reduced to homogeneous systems, are being constructed and published, which will make possible a far more accurate study, both of current temperatures and of temperature-departures. A new form of snow-bin, designed to give a fair catch of snow in mountainous districts which can be visited only at intervals, and to store the snow and rain until it can be measured, is being experimented with. The relation between runoff, seepage, discharges, floods, lags and flood-forecasts is being studied. Evaporation is being investigated at the Salton Sea, and elsewhere, and a formula is being developed which it is believed "will be applicable in all climates."

Problems connected with the general circulation of the atmosphere, especially in connection with seasonal forecasts; with the measurement of solar radiation, and economic questions relating to the damage done by floods, winds and waves are also suggested as important subjects for thorough investigation.

R. DEC. WARD.

FORESTS, CLIMATE AND FLOODS. Prof. Willis L. Moore, Chief of the Weather Bureau, has made a report on "The Influence of Forests on Climate and on

Floods" to the Committee on Agriculture of the House of Representatives. This report has been published as a pamphlet (Washington, D. C., 1910, Government Printing Office), and widely distributed. It appears, from a *Note* which is printed on the outside of the front cover, that the present argument resulted from a request of the chairman of the committee that Professor Moore should submit further information on this subject, the latter having already given some evidence before the same committee in 1909. That portion of the report which deals with forests in their influence upon climate is on the whole a fair presentation of the views generally held by meteorologists, but, in his discussion of the effects of forests and of deforestation upon floods and run-off, the author cannot be said to have stated the opinions which the majority of engineers maintain in this matter.

R. DEC. WARD.

WIND OBSERVATIONS IN RELATION TO AERONAUTICS. That progress in meteorology means progress in aeronautics is a statement the truth of which few will care to challenge. Similarly, progress in aeronautics means progress in meteorology. The study of meteorological data which may be of practical use in aeronautics is advancing rapidly. Thus, in Germany, at the request of the "Motorluftschiff-Studiengesellschaft" of Berlin, Professor Assmann has recently completed an analysis of the wind data available for the Empire (*Die Winde in Deutschland*, Braunschweig, 1910, pp. 48). The percentage of frequency of wind from the eight principal directions is given for about fifty stations for the twenty years 1886-1905, together with a subdivision of winds from each direction according to estimates made on the Beaufort scale, and not as determined by the anemometer.

For Italy there is also a new publication on winds, prepared at the request of the Italian Aeronautical Society by Dr. Filippo Eredia, of the Central Meteorological Office (*I Venti in Italia*, Rome, 1909), and printed in the *Rivista Tecnica di Aeronautica Italiana*. Data are given for 111 stations as to wind direction, and a series of colored plates shows the results graphically. That such studies as these two will prove of great practical importance to those who are interested in aeronautics is obvious, and they will be equally important to meteorologists and climatologists.

R. DEC. WARD.

Corrigenda. As the author was unable to revise the final proof of the paper, "The Caverns and People of Northern Yucatan" (*Bulletin*, Vol. XLII, No. 5, May, 1910, pp. 321-326), certain errors need correction:

p. 323, explanation of Fig. 2, in third line change, "see Fig. 7" to read "see Fig. 9."

p. 325, explanation of Fig. 8, change the first word, "when," in line 7 to "where."

p. 325, third line below figure, change "Figure 4" to read "Figure 5."

p. 325, third line from bottom, change "Fig. 5" to read "Fig. 6."

p. 326, line 17, sentence beginning "Figure 3," change to read "Figure 4 may be taken to represent a section of the Ikil cenote, and Figure 3 as an intermediate stage," etc.

p. 330, explanation of Fig. 11, change "Photo by E. H. Thompson" to read "Photo by H. E. Sargent."

p. 333, explanation of Fig. 14, for "E. J. Thompson" read "E. H. Thompson."

p. 334, line 22, for "day" read "dry."

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

The Islands of Titicaca and Koati. By A. F. Bandelier. xvi and 358 pp., and 85 plates, including sketches, plans, maps and photographs. The Hispanic Society of America, New York, 1910.

In reading this scholarly book one is reminded of the remark recently made by a reviewer that "one after another the different domains of research seem to be creeping out of the twilight zone of campaign oratory." The world is full of descriptive books that pass as authoritative in the minds of the multitude even though the author is without an inch of standing room in his chosen field of work. Almost every globe trotter and casual traveler is not content until he has written his book, filled with twaddle though it may be; and not a few reputations are built upon such sands. Here is a man who did not ramble through a continent; he simply journeyed to the islands of Titicaca and Koati in Lake Titicaca, toiled long months at his task under dreary conditions, then returned to the even greater task of analyzing and comparing the books of the scholars. The result is a work that is erudite, authoritative, modestly written, substantial. One does not herald even the best books in the public places nowadays, but long after Bandelier has completed his work, centuries after, his book will be gratefully read and admired in the company of scholars.

An excellent historico-geographical description of the Titicaca drainage basin, with maps and topographic cross-sections, constitutes the opening chapter. As in all the succeeding chapters, the notes, collected into a separate section, are very full and of almost equal value with the text. They represent extended reading, critical examination, scholarly comment. A discussion of the physical aspect and general condition of the islands of Titicaca and Koati follows and is preparatory to the next, the most important, and the longest chapter of all, that on the Indian inhabitants of Titicaca. At every step there is comparison with the life conditions of related population groups on the mainland. The data were gathered under extraordinarily difficult conditions, as anyone is aware who has attempted to draw information from an Aymara Indian, which is almost equivalent to saying one has tried to draw blood from a stone. In the fourth chapter is a description of the ancient ruins on Titicaca, which were studied with great care, sketched, and in some instances mapped topographically. Of special interest are the conclusions concerning the ancient and modern terraces and the system of rotation of fields in vogue among the earliest inhabitants of the terraces. The system is still practiced through an annual allotment, by the native caciques, of the land that is to be cultivated. The large surface required under this system, and the long period of rest, or of fallowing, that follows a year of cultivation, has led in many instances to the erroneous conclusion that a large decrease

of population has occurred. The ruins of Koati and the aboriginal myths and traditions concerning the island of Titicaca are the subjects of research in the two last chapters of the book. There is an indication in one of the notes that the author will soon publish a more extended work on Bolivia, and the character of the book before us is ample ground for the cordial hope that it will be published soon.

ISAIAH BOWMAN.

Crete, the Forerunner of Greece. By Charles Henry Hawes and Harriet Boyd Hawes. Preface by Arthur J. Evans. xiv and 158 pp., map, plans, bibliography and index. Harper & Brothers, New York, 1909.

As the area for new discoveries over the earth's surface becomes from year to year more restricted and the legend *Terra incognita* is daily falling into disuse among the map-makers, man is forced to travel back, chronologically instead of longitudinally, if he would seek new lands and learn of strange peoples. The spade of the excavator is supplanting the oar of the mariner; and the traveller's tales brought back from buried years are hardly less wonderful and scarcely more credible than those which amazed our forefathers on the return of some early voyager. Fifteen or twenty years ago Homer and the Homeric age marked the day-spring of Greek civilization and the legendary date of the Trojan war stood like a boundary stone on an unknown and apparently unknowable chronological wilderness. But Dr. Evans and his fellow workers in Crete have changed all that, and this little book in Harper's "Library of Living Thought," by two of those workers is a record, up to date, of that change. How completely our earlier notions have been upset is evident from the start we receive on finding the Trojan War the last and closing date of a long and glorious chronology. The Year 1200 B. C. is so recent, so near to yesterday, that age upon age, period upon period, of human activity and progress, in government, commerce, architecture, art, and even in writing are set back of that time until we reach the Neolithic.

The book is a plainly written and evidently popular account of the discoveries in Crete on which this remarkable extension of our mental horizon backward into the origins of European life is based. The principal sites, the exhumed treasures, and the great palaces are described, and the old life of the Minoan people is set forth in considerable detail, even to the plumbing of their houses and the latest modes of the ladies' dress. A short preface by Dr. Evans himself assures us that the two authors speak with knowledge. An apology for a map is barely sufficient to enable us to locate the ancient sites, and leaves us happily free to fill in rivers and mountains, roads and railroads (if such exist) to our heart's content, thereby differing from the work of early cartographers who peopled their waste places with strange beasts and stranger names. In other respects the appearance of the little volume is good.

STEPHEN A. HURLBUT.

The Nitrate Deposits of Chile. By R. A. F. Penrose. *Jour. of Geol.*, Jan.-Feb., pp. 1-32, Chicago, 1910.

The much-discussed problem of the nitrate beds of northern Chile is here reviewed and some new light thrown upon it. After an introductory statement as to the history of the nitrate mining industry and the physical features of the nitrate region, the author discusses the mode of occurrence of the nitrate deposits

in Tarapacá and other nitrate regions. There is a long section describing the industrial methods employed in developing the nitrate deposits, the rate of production, and the uses of nitrate of soda. The final paragraph describes the nitrate deposits in other parts of the world.

Regarding the origin of the nitrates the author concludes that they were produced mostly from nitrogenous animal matter in old guano beds which once lined the waters of the interior basin. The guano deposits are assumed to have been formed as border accumulations during the time that the nitrate pampa was a part of the ocean floor and also during the later period when elevation of the region transformed it into an open bay or gulf and finally into an enclosed sea. In this view erosion is responsible for the disappearance of the guano since the leaching which gave rise to the concentrated nitrate. The occurrence of the nitrate in the form of sodium nitrate is attributed to the abundance of sodium salts in the region. Common salt was deposited upon the final evaporation of the waters of the enclosed sea. It is granted that a small amount of the nitrate may have been derived from the decay of marine and land vegetation about the borders of the tract. To the decay of marine plants is also attributed most of the iodine associated with the nitrate. The borates in the deposits are thought to have been derived from boron-bearing minerals and from springs carrying boron compounds. While these conclusions appear plausible the author admits that a vast amount of geological and chemical details must yet be worked out before the subject can be fully understood.

ISALAH BOWMAN.

Traité de Géographie physique. Par Emmanuel de Martonne.

Completed in 4 parts. 1—Climat; 2—Hydrographie; 3—Relief du Sol; 4—Biogéographie. Parts 1 and 2, 412 pp., Photographs, Maps, Diagrams and Bibliographies. Librairie Armand Colin, Paris, 1909. 5 frs. a Part.

The author introduces this "Treatise on Physical Geography" with an interesting chapter on the evolution of the science from the geography of the ancients to that of the modern schools. On the basis of this review he proposes to define geography as the science of physical, biological and social phenomena, considered as to their distribution, their causes, and their mutual inter-relations.

The second chapter in the first part of the work discusses the form of the earth, its rotation and its revolution about the sun, and includes an interesting account of the effects which these physical phenomena have upon human conditions. Believing that no country is geographically known until a number of latitude and longitude determinations have made possible a proper map, and that the map is the basis of all geographic knowledge, the author devotes a chapter to a rather extended account of latitude and longitude determinations, including some description of the instruments used; and of the subject of map projections. He next presents a variety of miscellaneous matters under the title "the elements of physical geography." Here are treated such topics as the composition of the atmosphere, the distribution of lands and oceans, continental and oceanic reliefs, waves, tides and currents, terrestrial magnetism, internal heat of the earth, volcanoes and earthquakes, and the work of winds, streams, and glaciers.

Seven chapters are devoted to the subject of Climate. After a detailed account of the several factors of climate, in which are set forth the principal features of atmospheric temperature, pressure, and humidity, there follows a

discussion of "weather types," including an account of the changes due to cyclonic movements of the atmosphere, and such special phenomena as the cold waves of North America and the southerly bursters of Australia. The "principal climatic types" are treated under the general heads: equatorial, tropical, and subtropical climates, temperate climates with cold season, warm and cold desert climates, cold climates with temperate season, and polar climates. These are further divided in the detailed treatment covering some fifteen pages, and their distribution is shown on a colored map. In discussing the subject of climatic changes, the author expresses his doubt as to the verity of progressive dessication within the historic period. A chapter on mountain climate follows. While reading this part of the work, one is continually disappointed at the author's failure to present an adequate account of the economic aspects of climate. After reading the opening chapters, one is prepared to find in Part II a much more thorough treatment of the effect of climate on man than the text includes.

The next section is entitled "Hydrography," and the introductory chapter deals with the forms and depths of ocean basins, the temperatures and salinity of ocean waters. Then follows an account of waves, tides, and currents. In discussing gulfs and mediterranean seas, the features characteristic of the more important examples are set forth in some detail, and the treatment becomes regional rather than systematic, in contrast with the method employed in most of the text. The topographic features of lakes are briefly described; several pages are devoted to the question of lake origin, while the temperature and movements of lake waters, and the variations of lake levels are treated more fully. Young, mature, and old lakes are described; but the relation of lakes to stages of stream development is not emphasized. The remaining chapter deals with rivers, and is largely devoted to what may be denominated the regimen of streams. Springs are discussed, and their relation to stream action is pointed out; the conditions affecting stream volume are set forth, and a classification of streams based on conditions of alimentation is elaborated by means of type examples. Such topics as stream development, the characteristics of meandering streams, and the beneficial and harmful effects of stream action, are omitted; the treatment of hydrography must therefore be considered both incomplete and uneven.

The next section of the work deals with land forms. Only two chapters of this part appear in the parts here reviewed. The first presents an account of the methods of map making; here one misses illustrations of contour and hachure maps, which would add much to the value of the text. The figure (160) used to explain the principle of curved relief is misleading, because the transparent block diagram is so constructed as to show a down-curved surface, whereas the contours projected from it represent an up-curved surface. In the second chapter, a discussion of the methods of determining mean elevations and other elements of land forms is followed by certain general considerations as to the importance of stream erosion and of climate in producing topographic forms. The work of ice, wind, and waves is briefly touched upon, and the work of the weather more fully treated. Excellent illustrations, including block diagrams, aid the understanding of the text.

It is perhaps unfair to offer general criticism before all parts of a work have been reviewed. But we may properly sum up our impressions of the details of treatment in the first half of the work. The reader must congratulate the author

for having brought together a great variety of interesting material, and for having presented it in a most readable text. The author's style is characteristically French in its clarity, and the few photographic illustrations are excellent. Among the errors which have crept into the text, one of the most noticeable appears in the explanation of the use of the pendulum to determine the form of the earth (Part I, page 34). In order to emphasize the fact that the force of gravity increases toward the poles and decreases toward the equator, the author states that 'the force of gravity increases as one approaches the centre of the earth, as has been proved by observations in mines;' whereas the reverse is the case. Probably the most serious criticism which should be offered is the markedly uneven treatment which mars the unity of the work. Some chapters place much emphasis on the economic aspects of physical features, while others practically ignore this phase of geography. Details of little geographic value encumber the text, and important topics are wholly omitted. These are unfortunate defects in a work which is excellent in most other respects. D. W. JOHNSON.

In Wildest Africa. The Record of a hunting and exploration trip through Uganda, Victoria Nyanza, the Kilimanjaro region and British East Africa, with an account of the ascent of the snowfields of Mount Kibo, in East Central Africa, and a description of the various native tribes. By Peter MacQueen. xiii and 402 pp., 64 plates from original photographs, map, bibliography and index. L. C. Page & Company, Boston, 1909. \$3.

From the geographical point of view this is one of the best of the African hunting books because it gives so much good and accurate information about the east and central regions in which the author travelled. The incidents of the chase are numerous and varied enough to satisfy any Nimrod; and the various tribes, their lives and homes, and East tropical Africa under the white régime, are so well described that the book may be recommended to all readers both as entertaining and as edifying. To be sure, a little slip occurs, now and then. Victoria Nyanza may be said by the most recent surveyors to be larger than Lake Superior, but they are mistaken. The illustrations are excellent and most of them were taken by Mr. Peter Dutkewich, the author's companion.

Zur Meteorologie von Peru. Von J. Hann. Aus den Sitzungsberichten der K. Akad. der Wissens. in Wien. Mathemnaturw. Klass. Bd. CXVIII. Abt. II a., 90 pp., Wien, Nov., 1909.

With his characteristic skill and thoroughness, Dr. Hann has compiled and analyzed the meteorological records obtained at the various Peruvian stations of the Harvard Observatory during the years 1888-1895. The establishment of these stations was described, and the data obtained at them were published in the *Annals* of the Astronomical Observatory of Harvard College, Vol. XXXIX, Parts I and II and Vol. XLIX, Parts I and II, but the numerical results have never been subjected to mathematical analysis, and as originally printed left much to be desired. No one in the world was better fitted than Dr. Hann to undertake this task. He has critically studied the various more or less broken series of observations; has discovered and corrected various errors, and has obtained results which are full of interest and importance for the meteorology of Peru. The present monograph is distinctly meteorological rather than climatological; the methods of reduction and of computation are rigidly mathematical. Yet the

results obtained, in regard to pressure, temperature, humidity, precipitation, cloudiness and wind movement, will obviously be indispensable to those who are making a thorough study of the climatology of Peru. The distribution of the various stations, at different altitudes, including the famous Misti station (19,200 ft.), the highest in the world, and in the different climatic provinces, covers a wide range of meteorological phenomena, and throws light on many interesting points. To comment on these, even briefly, would unduly extend this notice. Dr. Hann has done American meteorology a distinct service in analyzing for us data originally secured through the financial support of an American benefactor, and by the splendid efforts of American scientists in Peru, viz.: Professor William H. Pickering and Professor Solon I. Bailey.

R. DE C. WARD.

Across Papua. Being an Account of a Voyage round, and a March across the Territory of Papua with the Royal Commission. By Colonel Kenneth Mackay. xvi and 192 pp., 40 plates from photographs, map and index. Charles Scribner's Sons, New York, 1909. \$2.50.

Col. Mackay was chairman of the Commission sent by the Commonwealth of Australia to inquire into the conditions and methods of government of British New Guinea, now officially known as Papua. The Commission travelled through a large part of the Territory and its facilities for acquiring the best information were, naturally, of the best. The inquiry resulted in a report which is packed with valuable data.

The present book is given to a popular account of the territory as the author saw it. The reader gathers from it the general atmosphere of things, what the author has deduced from a study of details. He gets a general idea of the country, the adaptability of parts of it to produce trade commodities, the relations between the whites and blacks and the attitude of the natives towards the new régime, including labor. For the most part, the book treats, interestingly, of the Commission's wanderings in the New Guinea bush and the narrative is enlivened by many anecdotes and incidents.

The author found the natives, in a number of places, working well for the whites in the development of the rubber, cacao, copra, tobacco and other industries. He believes the missionaries are exerting a most helpful influence. They are proving that the blacks may be trained to produce good results in carpentry, joinery and other forms of skilled labor. Papua, also, is beginning to make war on the *anopheles* mosquito and marked improvement in health conditions is observed in some places. Col. Mackay has faith that Papua and her people will make progress and that the world will have use for their productions.

Fifty Years in Constantinople and Recollections of Robert College. By George Washburn, D.D., LL.D. xxxi and 317 pp., and Illustrations. Houghton Mifflin Company, Boston and New York, 1909. \$3.

This book is much more than a history of the first forty years of Robert College. The events of the last fifty years, which led up to the recent revolution in Turkey, are summed up in the introductory chapter; and we are constantly reminded, while perusing this story of the vicissitudes and the development of Robert College, that it has a background of events and personalities that make it peculiar among all educational institutions. Dr. Washburn was, for many years,

closely associated with Robert College as director and president, and he writes from fullness of information of the ups and downs, the struggles, the trials and the triumph of this unique educational experiment.

The training and development of the physical, intellectual and moral powers of 2,500 boys of the East, so that these students, in the conspicuous places many of them have occupied, have long been recognized as representing a different type of manhood from that commonly seen in the Orient, is only one of the achievements of Robert College. It has revolutionized the policy of missionary societies with regard to education, and there are now many such institutions in different parts of the world. The college has also been influential in bringing about a less hostile state of feeling between the different races of the East, and it has had great success in winning the confidence of the surrounding Mohammedans. The author's fascinating story of the college is not cast in a precise historical vein, but is a record of personal recollections in which he speaks freely of events and personalities as they appeared to him.

Les Civilisations de l'Afrique du Nord. Berbères-Arabes-Turcs. Par Victor Piquet. ix and 392 pp. and 4 maps. Librairie Armand Colin, Paris, 1909. Fr. 4.

This book fills a need because it is the only work, in moderate compass, that gives the history of the northern part of Africa before the French occupation. Two or three learned works give much attention to various epochs of this history; and, at last, we have this little volume which concisely tells the whole story of the civilizations that succeeded one another in the large regions now known as Tunis, Algeria and Morocco. Broadly speaking, the complete history of North Africa should be divided into three parts: 1. The history of the peoples of Barbary (Lybians, Numidians and others) until the arrival of the Arabs; 2. The history of the Mohammedan governments until the establishment of the French; 3. The work of the French in North Africa. The first two periods are treated in this volume, and a part of the first period is considerably abridged because the history of the Roman rule in North Africa has been made well known in remarkable and standard works.

Many readers of this book will be especially impressed with the fact that, for many ages there was no political boundary dividing this wide home of the North African peoples. Frontiers cutting up the great area into different countries, is a comparatively modern and wholly artificial innovation. Even writers of to-day treat scientifically of the antiquities of Algeria without mentioning those of Tunis, which, nevertheless, was the cradle from which the successive civilizations of North Africa spread.

The work is based almost entirely upon the original Arabic chronicles, long extracts from which are given. The book is full of matter that is new even to the well read part of the public. It should be in every public library as the only work of the kind that has yet appeared and because it adequately treats its topic.

Die Blütenpflanzen Afrikas. Eine Anleitung zum afrikanischen Siphonogamen. Von Franz Thonner. xvi and 673 pp., 150 plates, map and index. Verlag von R. Friedländer & Sohn, Berlin, 1908. M. 10.

The author is an Austrian botanist. His recent field studies in his specialty have been carried on largely in the Congo basin. This large work, finely pro-

duced and splendidly illustrated, should be of much practical utility. The labors of many competent men have now made the flora of Africa very well known in all its characteristic features. It is highly desirable that travellers and colonists in Africa, as well as botanists in Europe and America, should be provided with a book that will enable them to determine the names, or at least the species of the African plants that interest them. This helpfulness will be found in Mr. Thonner's book. It includes all the species of the flowering plants that are now known in Africa and its islands. The author arranges the plants in 221 families. Under his description of the general characteristics of each family, he gives a paragraph to each of its species, describing it, and giving its habitat, its uses, if any, and referring to the appropriate plate, if the plant is illustrated. He has, of course, drawn largely upon the results of other botanical specialists in the African field.

The Autobiography of Sir Henry Morton Stanley. Edited by his wife, Dorothy Stanley. xvii and 551 pp., 16 photogravures, map, and index. Houghton Mifflin Company, Boston and New York, 1909. \$5.00.

Stanley was a masterful man, full of natural resource, well fitted by nature to be the leader of a military campaign or the revealer of a continent. He undertook some of the hardest tasks that ever fell to human lot and his genius helped him to carry to a successful end everything he ever attempted to do. He had many friends and many severe critics. No man ever more highly praised his subordinates, white or black, who had it in them to perform their duty well; but he had no patience with incompetency, no use for the man who fell short of the mark and could not perform the task assigned to him. It was the men who failed in his service that wrote bitterly of him and his work and most that they said was not true. In his long career as an African explorer, he steadily improved in the quality of his work, for, at the outset, he had no training for scientific exploration. His map of the Congo as he followed it to the sea is, in all its large features, practically the map of the Congo as we know it to-day. If we sum up all his voluminous writings on Africa to express, in a word, their value to the world, we may simply say that Stanley told the truth. And he soon grew to share Livingstone's perfect faith that there was good in Africa and in its peoples that every proper influence of civilization should help to foster and develop. Livingstone and Stanley were the men of faith and inspiration who set on foot the great African movement that has brought to light nearly every corner of the continent and is making such wonderful progress in the work of development since the era of pioneer exploration closed.

Most of this book is Stanley's own narrative of his life and work. Here, for the first time, we have the complete story of his life. With his deep sincerity, wonderful self-revelation, and remarkable literary style, he makes the reader see the babe in the cottage cradle, then the grim workhouse, the squalid life in Liverpool, the terrible experiences at sea, the dawn of freedom in America, where he was adopted by a New Orleans merchant; then his life as a planter, his enlistment in the Confederate Army, the wonderful picture of Shiloh, and his life in prison and escape. From his journals, notes, letters, speeches, etc., it has been possible to continue the story of his life largely in his own words—his return to England and experiences in journalism; the finding of Livingstone, exploration of the Dark Continent, the founding of the Congo State and the

rescue of Emin; and finally his Parliamentary career and closing years. His journals and private letters bring out the inner history of many important events and episodes which have not hitherto been made public.

Among the fine illustrations are seven portraits of Stanley at different periods from his childhood to within four years of his death. So much of his life was absorbed by Africa that we may regard this remarkable autobiography as a rich contribution to the literature of the great continent to which he gave so unstintedly his wonderful energy of mind and body.

Cyrenaica. Report on the Work of the Commission sent out by the Jewish Territorial Organization, under the Auspices of the Governor-General of Tripoli, to Examine the Territory Proposed for the Purpose of a Jewish Settlement in Cyrenaica. By J. W. Gregory and Others. xiii and 52 pp., Maps, Illustrations, and Appendix. Ito Offices, London, 1909.

Cyrenaica is the large projection of land on the northern coast of Africa between Egypt and the Great Syrtis. The Jewish Territorial Organization, of which Mr. Israel Zangwill is president, conceived the idea, that this land, reputed to have once been populous and rich, might afford a comfortable home for many of those Jews who cannot or will not remain in the lands in which they at present live. The Organization accordingly sent out an expedition, led by Dr. Gregory, Professor of Geology at the University of Glasgow, to examine the territory proposed for a Jewish settlement. The work of the expedition was thoroughly performed, but the results were disappointing so far as the colonization project is concerned. The report includes a careful estimate of the water supply based upon the rain-gauge at Benghazi and also on the limited yield from the few springs on the plateau and from a study of the beds of the hill streams, many of which, evidently, cannot have carried water down them for many years. It seems to be proven conclusively that, owing to its lack of water, Cyrenaica could never have maintained a very large population. There is considerable rainfall, but the porosity of the soil has made the water largely unconservable and irrecoverable.

While the report is unfavorable to the hopes of those who are promoting the cause of Jewish colonization, it is a valuable contribution to geography. It carefully describes in its geographical, hydrographical, climatic and economic aspects, a region of which very little was known. It is introduced by an historical and political preface by Mr. Zangwill.

Man in Many Lands. Being an Introduction to the Study of Geographic Control. By L. W. Lyde, A.M. vii and 184 pp., and 24 illustrations in colors. Adam and Charles Black, London, and the Macmillan Company, New York, 1910. 65c.

Professor Lyde has shown in his excellent textbooks that he has a talent for tracing the relation between life and its geographic environment. The present work is of the nature of a geographic reader for students in the secondary schools. We do not recall having seen elsewhere in the same compass and for the perusal of young students, a treatment so large and so illuminative as this, of the subject of geographic control. No boy or girl can read the book without pleasure and edification or hardly fail, in all later reading, to look for the influence that

the inorganic exerts upon the organic. Some of the author's assertions, however, are not convincing, as where he undertakes, for example, to explain what he calls the "twang" in the pronunciation of English in some parts of our country; and some of his statements appear too sweeping and might better have been omitted.

He speaks of conditions in a certain island that "have bred a most quarrelsome spirit among the people so that they are more notorious now for their vendettas than for anything else." This is true, but the guide books unanimously invite tourists to this island, for it has remarkable beauty and interest; and John Mitchel Chapman, who has visited it many times and has written one of the latest books on it, says of the inhabitants that "to the stranger they are the most kindly, the most courteous and the most hospitable people imagination can picture." The author should either have written more or nothing, for the impression he makes is not wholly just. Again, he speaks of one of the great nations as "cursed by political and ecclesiastical tyranny." A phrase like this, practically unqualified, should not be placed before a young student, in his school.

The very fine illustrations hold truth up to nature as the pictures in few school books do.

Pre-Historic Rhodesia. An examination of the Historical, Ethnological and Archæological Evidences as to the Origin and Age of the Rock Mines and Stone Buildings, with a Gazetteer of Mediæval South-east Africa, 915 A. D. to 1760 A. D., and the Countries of the Monomotapa, Manica, Sabia, Quiteve, Sofala, and Mozambique. By R. N. Hall, co-author of "The Ancient Ruins of Rhodesia" and author of "The Great Zimbabwe, Mashonaland." With Illustrations, Maps and Plan. George W. Jacobs & Co., Philadelphia, 1909. 8vo. \$3.50.

"Pre-historic Rhodesia is the first instalment of the reply to Professor Maciver's conclusions." In these words the author throws down the gauntlet inviting battle, for it is not probable that Professor Maciver, whose conclusions are directly opposed to those of Mr. Hall, will fail to reply warmly to the vigorous challenge of this attractive volume written with authority and straightforwardness. Mr. Hall does not equivocate. We understand exactly what he means with every line. While speaking most respectfully of Professor Maciver and his conclusions as set forth in "Mediæval Rhodesia" and in certain papers read before societies, Mr. Hall proceeds to grind them into the dust. The battleground is Southeast Africa—the region south of the Zambezi river—where extensive ruins of stone buildings long have been known to exist, but have been scientifically noticed only of late years. The chief problems which are to be settled are age and origin. Who were the builders and when; why constructed and why abandoned so long ago that there is no native knowledge or tradition of the builders or occupants? Mr. Hall and Professor Maciver differ entirely on the enigma, the latter asserting positively that there was no intrusion of foreign influence into this region, now called Rhodesia, earlier than the eleventh century A. D., and that the greatest ruin, of all that have so far been noted, the Zimbabwe Temple, is certainly not earlier than the fourteenth or fifteenth century A. D., which Mr. Hall declares to be impossible, because "had it been

built in 1500, the Moors must have seen it before it was erected, which amounts to a *reductio ad absurdum*." Mr. Hall places the date of the building prior to 610 A. D. and also claims that it is later than the rock-mines from which enormous quantities of gold were taken.

Professor Maciver holds that the buildings were the work of natives without extraneous aid, "a negroid or negro race of African stock" and that the rock-mining was done by the same people; that is to say, the whole development to be found here was the result of the evolution of certain native stocks. Mr. Hall, on the other hand, assures us that this could not be the case and gives many reasons for his belief. He is sure from his examinations that the works are to be ascribed to Arabs, Persians and Indians who came before the dawn of the Christian era after the gold. They came by sea and entered by the valley of the Sabi river, in whose upper drainage basin and in that of the adjoining Limpopo the mines and ruins mainly occur. There are three or four classes of the ruins, according to Mr. Hall, some belong to remote pre-historic times, some to mediæval and post-mediæval, and some crude walls to the modern Ma-Karanga tribe. He classes the mines in the same way. The area covered is over 400,000 square miles, and as only a small part is accessible by railway, the difficulties in the way of complete exploration are great. "Not a single one of the hundreds of ruins has as yet been examined. Not a tenth part of the Zimbabwe Temple has been explored." From this it is apparent that the time for positive statement of any kind concerning the ruins or the mines has not arrived.

There is nothing improbable in Professor Maciver's contention, and the same may be said of the claims of Mr. Hall. It is estimated that more than \$375,000,000 in gold was taken from the rock in this region in pre-historic times. What has become of it? On the lowest floor of some of the ruins examined, manufactured ornaments of pure gold have been found thickly strewn, and rich finds in this line await the explorer everywhere, no doubt, but this would hardly account for the vast amount of gold mined. In the introduction to a former book by this author (Great Zimbabwe) Dr. Keane suggested that the Rhodesia region was the land of Havilah, and that the structures and mining were the work of the South Arabian Himyarites, followed in the time of Solomon by the Jews and the Phœnicians. The "gold of Ophir" was the gold brought to Ophir from what is now Rhodesia, for exchange.

The usual tendency is to enshroud unknown ruins and the unknown builders with a pall of mystery which eventually is swept away by the truth, as we have seen on this side of the water in the cases of the Moundbuilders, the Mayas and even the Cliff-dwellers. It is more romantic to believe the ruins of Rhodesia to have been built by pre-Koranic gold-hunting Arabs than by common natives merely working out their own fate.

Judging from the pictures in this book there is nothing about the Rhodesia ruins that is evidence against Professor Maciver's theory. The walls are simple, they seem to be of dry-masonry, the ornamentation is meagre and primitive, and the few carvings found are also primitive. So far the evidence seems to indicate a low grade of culture for the builders. Fragments of Nankin china, certain iron and copper articles, as well as the gold, have been found. Some of these are recent intrusions, especially the china which Professor Maciver

adduces as evidence of the comparatively modern construction of the buildings, while Mr. Hall maintains that none of it has been found in a position that would warrant such an inference.

The volume is exceedingly interesting and the questions involved bear on some of the most romantic pages of the far past. There are illustrations from photographs, and maps of the region under discussion, and a plan of the Zimbabwe temple to aid the reader. The subject is very well and clearly presented from Mr. Hall's point of view.

Opinions Chinoises sur les Barbares d'Occident. Par Com't. Harfeld. viii and 308 pp. and many illustrations. Albert Dewit, Brussels, 1909.

A unique book. The author recently lived in China for four years as a civil engineer in European service. He met many of the educated natives and endeavored, with considerable success, to draw them out on questions relating to the inner life and thought of the Chinese, their own ideas concerning their country and government, their relations with other peoples and their views on western civilization. The son of Han is not an open book, but the author really succeeded in getting hold of many of his points of view. About a third of the book is given to the opinions of a high Chinese official. China for the Chinese, he maintains, is the only policy his people should uphold. He gives a long list of China's grievances—the harmful influences of the privileges accorded to foreign merchants, the wicked infliction of India's opium upon China, the territorial concessions forced from the Chinese government, the laws against Chinese immigration in western lands, the cruelties inflicted upon Chinese coolies by foreigners, the abuse of the western newspaper press, the utter failure of the western world to understand the genius, the spirit and ideals of the Chinese, and so on. About 40 pages are given to the grievances of the Chinese against the missionaries.

Another section is given to Chinese criticisms of western nations, including their administrative and financial scandals, the high barriers that separate the classes, nepotism, anarchism, great standing armies, etc.; coming to smaller detail the Occident is censured for its waste of forests and other natural resources, its towering buildings, the ridiculous attire of its men and women, and its social habits, many of which violate good taste and propriety. The book is entertaining reading and the author has apparently striven honestly to enable us to see ourselves as some, at least, of the Chinese see us.

The Government of the People of the State of Michigan. By Julia Anne King, M. A. Revised edition. Hinds, Noble & Eldredge, Philadelphia, (1896). 50 cents.

This is an excellent historical sketch of the government of Michigan from the earliest European occupation of the region down to the present day, for the use of schools, but it is also a good handbook for library use. The constitution of the State is printed in full and an appendix gives a part of the ordinance of 1787; "An ordinance for the government of the Territory of the United States Northwest of the river Ohio," which was preliminary to the formation "of not less than three nor more than five states from the said territory." This was the "North-west Territory" whose history forms one of the most interesting parts of the story of the growth of the United States.

Diamonds. By Sir William Crookes, LL.D., D. Sc. xvi and 146 pp., and 24 illustrations. Harper & Brothers, New York and London, 1909. 2s. 6d.

Probably no one could write better on this subject than the great chemist whose name is on the title-page, not even Mr. Gardner Williams, who is credited by the author with knowing "more about diamonds than any man living." Besides most carefully studying the diamond in so favorable a place as South Africa, where he made two visits, Sir William has himself produced diamonds artificially from molten iron. Manufactured diamonds, however, are microscopic, the largest made being less than a millimetre across. Not till pressure and temperature can be obtained and maintained sufficiently high to liquefy and solidify carbon in considerable quantity can a diamond of some size be expected from the furnace.

In this little book Sir William, besides describing the South African mines, discusses the possible method of the formation by natural process of the diamond, as well as the method of artificial manufacture. The Canyon Diablo (Arizona) meteorite diamonds are likewise described and illustrated. Though the volume is small, it contains much more real information on the subject discussed than many a larger volume does; and it is presented clearly.

Sir William says: "I have done my best to explain the fiery origin of the Diamond, and to describe the glowing, molten, subterranean furnaces where they first begin mysteriously to take shape. I have shown that a diamond is the outcome of a series of Titanic earth convulsions, and that these precious gems undergo cycles of fiery, strange, and potent vicissitudes before they can blaze on a ring or a tiara."

Terry's Mexico. Handbook for Travellers. By T. Philip Terry. ccxl and 595 pp., two maps and 25 plans. City of Mexico, Sonora News Co.; Houghton Mifflin Co., New York, 1909. \$2.50.

Made on the general model of Baedeker, this is an admirable guide-book; the best in the field on the subject. It contains very full information on hotels, railways, tips, customs duties, shops, health, photography, etc., as well as good descriptions of towns, churches, boundaries, literature and all the other points expected in a guide-book but not always found there. In the extensive historical sketch Mr. Terry follows the lead of our romantic Prescott, speaking of Montezuma as "King" and further on of another chief as "Emperor." The style is agreeable and no traveller can afford to go to Mexico without this book, while it will be found an important reference volume for any library.

India of To-day. By Syed Sirdar Ali Khan. v. and 132 pp. Small 4to. Bombay Times Press, 1908.

The author says "the situation in India to-day is growing steadily worse and worse." Unrest and violence dominate the land, with no prospect of a near solution of the problem. In the judgment of some the difficulty has arisen through a too "soft-hearted" policy, and the remedy lies largely in a firmer rule. The author speaks in the highest praise of Lord Morley and declares he is the only member of the Government "capable of guiding the destinies of India through the present crisis." He believes that, widespread though the seditious spirit is, "it is possible once more to gather into the fold of loyalty all except the irreconcil-

ables—those who have found a new remunerative profession in disloyalty and who must be repressed and crushed at all costs." He adds that the British cannot leave India; their departure in any near period would mean immediate chaos. India, he affirms, is as little fitted for self-rule to-day as she was when the British first came. The British made an Empire out of heterogeneous populations and order can only be maintained by continuance of British rule. He believes in administrative reform, and the extension of the popular principle, but under British rule. An appendix gives the essential features of the Government of India's reform scheme.

A Discussion of Australian Meteorology. Being a Study of the Pressure, Rainfall and River Changes, both Seasonal and from Year to Year, together with a Comparison of the Air Movements over Australia with those over South Africa and South America. By William J. S. Lockyer. Under the direction of Sir Norman Lockyer. vii and 117 pp., Maps, Plates, and Appendix. Eyre & Spottiswoode, Ltd., London, 1909. 5s.

Begins with a brief account of the similar barometric changes that occur over the whole of Australia from year to year; summarizes the main features of Australia meteorology; the mean annual pressure and variations are shown and compared in order to determine their seasonal distribution; the changes from year to year of the pressure and rainfall are next compared and deductions are made with regard to the frequency of "southerly bursters;" the variation in the heights of river gauge readings on the Darling and Murray rivers are adduced as evidence to corroborate the rainfall changes; the results obtained from the data used to determine changes of long duration from barometric and rainfall statistics are summarized; the relation of Australian pressure changes to variations in other parts of the world, chiefly South America, South Africa and India, is discussed; and some facts are given which point to the similarity of air movements over South America, South Africa, South Indian Ocean and Australia. The whole discussion is based chiefly on the comparison of curves.

In an Unknown Land. A Journey through the Wastes of Labrador in Search of Gold. By Edward Colpitts Robinson. Introduction by Dr. Wilfred T. Grenfell, C.M.G. Small 8vo. London, Elliot Stock, 1909. 75 cents (3 shillings).

Labrador, though the first land on the American continent known to have been visited by Europeans (in the 10th century), remains still the unknown land. The Icelanders were not colonizers, nor were conditions ripe for settlement on this continent at that time, especially in Labrador, which even now is inhospitable. Its rivers are still mainly unknown, its mountains unclimbed, its vast forests untrodden. Dr. Grenfell predicts in the preface that one of these days we shall learn that, after all, Labrador is "one of God's countries, and therefore is an asset of no mean value." Naturally, the explorer and settler leave the least attractive till the last, but the crowding of populations in time will force settlements to the most forbidding places on earth. It is not surprising that Labrador has been left when the vast acreage of the more salubrious regions of the United States and Canada have been open. Mr. Robinson believes there is a "big future before inland Labrador," with its extensive forests, fine harbors, game, and pelts, and the undoubted mineral riches of the country. When we remember

that little children are now daily going to school in the North-west provinces of Canada in winter temperatures that a few generations ago were the terror of hardy explorers, we realize what systematic settlement in Labrador, with abundant food and shelter, may accomplish. Occupation of a region depends chiefly on the food question, and with railways in Labrador a population can be maintained there in working the resources, even if no foods can be obtained from the soil. Forethought is needed in cold regions, but otherwise they are in many ways preferable to tropical lands. Do away with the mosquito and the fly of the north and there is nothing uncomfortable or dangerous there. Dr. Grenfell has introduced the reindeer into Labrador, and as the moss and subsistence for this animal are abundant, there is no reason why it should not thrive as well here as in Alaska, where it is now domesticated. It is preferable to the dog as a traction animal and, besides, adds to the food resources. The dog must go, as it destroys the reindeer, is intractable, and more or less dangerous to man, Dr. Grenfell, himself, having had an experience with them never to be willingly repeated.

Cannes, Grasse, Juan-les Pins, Antibes. (Guides Joanne.) 69 pp., 12 photo-engravings, 2 plans and 3 maps. Hachette & Co., Paris, 1908. 1 fr. [A comprehensive and reliable guide to the many attractions, hotels, roads, etc., of these popular winter resorts.]

Das Problem der Entwicklung unseres Planetensystems. Aufstellung einer neuen Theorie nach vorhergehender Kritik der Theorien von Kant, Laplace, Poincaré, Moulton, Arrhenius u. a. Von Dr. Friedrich Nölke. xii and 216 pp., 3 figs. in text. Verlag Julius Springer, Berlin, 1908. M. 6. [A discussion of the various theories of the development of our planetary system fills nearly half of the book. The author's theory is based upon a new treatment of the nebular hypothesis, and he endeavors to trace our planetary system, in its present differing phases of development, back to its origin.]

Animal Figures in the Maya Codices. By Alfred M. Tozzer, Ph.D., and Glover M. Allen, Ph.D. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University, Vol. 4, No. 3. pp. 280-372, 30 plates, 24 illustrations in the text and bibliography. Published by the Museum, Cambridge, Mass., 1910. [A contribution to the study of Maya hieroglyphic writing. Dr. Tozzer prepared the paper on the interpretation of these conventionalized animal figures and Dr. Allen aided in the identification of the various species of animals that, under varying forms are used in connection with the glyphs.]

Schneiders Typen-Atlas. Naturwissenschaftlich-Geographischer Bilder-Atlas für Schule und Haus. Sechste Auflage. Farbige Ausgabe. C. C. Meinhold & Söhne, Dresden, 1910. M. 5. [This important work for schools was prepared by Prof. Dr. Oskar Schneider with the assistance of other specialists. There are 16 colored plates. On ethnographic, zoologic and botanical maps of each continent are printed numerals referring to the pictures; thus the student is supplied with data showing the distribution and appearance of the races, animals and types of the flora, on each continent.]

Cinquante Histoires d'Extrême-Orient. Mises en français, d'après les textes malais annotées et précédées d'un coup d'œil sur la Malaisie. Par Albert Mersier. 170 pp. Société Générale d'Impression, Paris, 1908. Fr. 3.50. [The

author presents here in French extracts from various Malay texts including works of the imagination, narratives, fables, history, etc. The curious and instructive little book is very entertaining and throws light upon the inner life of the Malayan peoples.]

Sudan Almanac, 1910. Compiled in the Intelligence Department, Cairo. 99 pp. Harrison & Sons, London, 1910. 1 s. [Contains many tables and notes relating to the Anglo-Egyptian Sudan. Five pages are given to the principal articles of barter in various parts of that region.]

Étude géologique et minière des Provinces chinoises voisines du Tonkin. Par M. A. Leclère, Ingénieur en Chef des Mines. 219 pp., and many photo-engravings and maps. Vve Ch. Dunod, Paris, 1902. [A valuable study of the geology and mineral resources of the Chinese territory adjoining Tonkin.]

Recuerdos de la Campaña del Acre de 1903. Mis Notas de Viaje. By Dr. Elias Sagárnaga. 194 pp. La Prensa de José L. Calderón, La Paz, 1909. [A good account of events and experiences in Bolivia's campaign against the gold seekers who attempted to establish the Republic of Acre in the northern part of that country.]

The Arctic and Antarctic Regions and the Law of Nations. By Thomas Willing Balch. Reprinted from *The American Journal of International Law*, April, 1910, pp. 265-275. [The author says that "the rules of the Law of Nations that recognize the freedom of the high seas would seem to apply naturally to a moving and shifting substance like the North Polar Sea ice at all points beyond the customary three-mile limit from the shore." The region around the South Pole is land, not a deep sea as at the North Pole. "But discovery alone is not sufficient to give a good title to a new, unoccupied land. The custom among nations for centuries, that gradually crystallized into a part of the Law of Nations, is that in order to perfect the right given by discovery, it must be followed by occupation." The author quotes many authorities in his lucid paper, and cites the case of Spitzbergen to which no nation has successfully asserted a claim of possession, so that those islands are now regarded as a joint possession of all mankind. Norway has recently invited the governments of other nations to send delegates to a conference at Christiania, this year, to arrange for the application of civil law and order in that archipelago. He concludes: "On general principles it would seem that both East and West Antarctica, two lands so much more difficult for man to occupy than Spitzbergen, should, following the liberal policy that has come to prevail in the case of Spitzbergen, become common possessions of all the family of nations."]

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NEW MAPS

NORTH AMERICA

U. S. GEOLOGICAL SURVEY MAPS

ALASKA. (a) Reconnaissance Map of Headwater Regions of Nabesna and White Rivers, Alaska. 1:250,000=3.95 miles to an inch. 141°-144° 10' W.; 61° 35'-62° 53' N. Contour interval, 200 feet. Topography by D. C. Witherspoon, T. G. Gerdine and S. R. Capps. Surveyed in 1902 and 1908. [Plane table triangulation with possible error of 2' in latitude and 3' in longitude. This is the region of the Nutzotin Mts. which adjoins the Wrangell Mts. on the north-east.] (b) Geologic Reconnaissance Map of Headwater Regions of Nabesna and White Rivers, Alaska. 1:250,000. Geology by F. C. Schrader, F. H. Moffit, A. Knopf and S. R. Capps under the direction of A. H. Brooks. [Geologic features imposed in colors on the topographic sheet, with gold and copper locations marked. These maps illustrate *Bull.* 417, "Mineral Resources of the Nabesna-White River District," by F. H. Moffit and Adolph Knopf, with a Section on the Quarternary by S. R. Capps, 1910.]

U. S. HYDROGRAPHIC OFFICE CHARTS

Pilot Chart of the North Atlantic Ocean, June, 1910.

Pilot Chart of the North Pacific Ocean, July, 1910.

U. S. DEPARTMENT OF AGRICULTURE MAPS

UNITED STATES. Soil Survey Maps of Etowah Co., Ala.; Hancock Co., Ga.; Caswell and Pitt Cos., and the Lake Mattamuskeet Area, N. C.; Center Co., Pa.; Coffee Co., Tenn. 1:63,360 and 1:62,500. [Issued by the Bureau of Soils with the co-operation of the several States. Each map is accompanied by descriptive text.]

GEORGIA. (a) A Preliminary Geological Map of Georgia. No scale. [Nine tints to show geological formations.] (b) Georgia Hydrographic Basins. [A black sketch map.] Illustrate *Bull.* 23, "A Preliminary Report on the Mineral

Resources of Georgia," by S. W. McCallie, State Geologist. Geol. Surv. of Georgia, Atlanta, 1910.

NEW YORK. Geologic Map of Southern Part of Manhattan Island, N. Y., with neighboring parts of Long Island. 1 inch=62 mile. Illustrates "Areal and Structural Geology of Southern Manhattan Island," by Charles P. Berkey in *Ann. N. Y. Acad. of Sci.*, Vol. 19, Part 2. New York, 1909. [Colored symbols for Fordham Gneiss, Inwood Limestone and Manhattan Schist. Bore holes located and differentiated for satisfactory or uncertain determination of rock.]

WEST VIRGINIA. Map showing occurrence of Coal, Oil and Gas in West Virginia. One inch=8 miles. By I. C. White, State Geologist. Drawn and reduced from Government and other Surveys by Ray V. Hennen and Walter L. Webb. Morgantown, W. Va., 1904.

SOUTH AMERICA

BOLIVIA. Bolivia. La Frontera del Norte. 1:500,000=7.89 miles to an inch. Publicado por Adolfo Ballivian, Jefe de la Comisión Boliviana. La Paz, 1910. [Showing the northern frontier as surveyed by Major P. H. Fawcett in 1906-7 with the astronomical points he determined.]

BOLIVIA-PERU. Mapa de la región discutida entre Bolivia y el Perú en el que se señalan las diversas pretenciones de los dos Estados, las líneas Gomez-Polar y la del laudo argentino. Por Adolfo Ballivian. 1:2,000,000=31.56 miles to an inch. Bolivian Government, La Paz, 1909. [The data relating to the boundary line include the demarcation proposed by the Argentine Commission, but the map was made before the final adjustment of the dispute between Bolivia and Peru by the Treaty of La Paz, Sept. 17, 1909, whose results were mapped in the *Bulletin* for June.]

DUTCH GUIANA. (a) Overzichtskaart van Suriname. 1:2,000,000=31.56 miles to an inch. [Shows triangulation net, regions not yet explored, native paths, etc.] (b) Bovenstroomgebied van de Suriname. 1:199,200=3.1 miles to an inch. By J. G. W. J. Eilerts de Haan. Illustrate paper "Verslag van de expeditie naar de Suriname -rivier," in *Tidsch. of the Roy. Netherlands Geog. Soc.*, Vol. 27, No. 3, Amsterdam, 1910. [Gives results of the detailed surveys of the Pikien and Gran Rivers, which unite to form the Surinam R.; also profiles of both rivers with 10 fold exaggeration of the vertical scale.]

AFRICA

SOUTHERN NIGERIA. The Central and Eastern Provinces of Southern Nigeria. Compiled under the Authority of Sir Walter Egerton, Governor and Commander-in Chief, by Captain W. H. Beverley. 1:500,000=7.89 miles to an inch. 4°-7° 30' N.; 4° 30'-10° 30' E. Drawn and engraved at Stanford's Geographical Establishment, London, 1910. [This excellent map in colors is the best recent contribution to the mapping of Africa. It is based upon the surveys of officers in the Royal Engineers and Southern Nigeria Marine and of political officers in charge of the various districts. The scale is large enough for the clear expression of a great amount of information. The map shows the administrative districts, and symbols differentiate between the large and small native tribes, trigonometrical and barometrical heights, surveyed and unsurveyed river courses, three classes of roads as distinguished from unimproved native paths; also

gives the provincial and district headquarters and much other political information, the distribution of mission stations, etc. The condition of communications is clearly represented. The best roads are well graded and bridged, average 15 feet in width, and, where metalled, are suitable for heavy traffic. The third class roads are native paths, straightened and cleaned, averaging 8 feet in width, and, in nearly all cases, they may be cycled over. The hill features are well shown in brown contours and all the telegraph lines and stations are indicated. The superior mapping of the large amount of survey material supplied reflects much credit upon the Stanford map-house.]

ASIA

CHINA. Itinéraire de M. Pelliot du Turkestan russe au Kan Sou. No scale. Illustrates paper "Trois ans de Mission dans la Haute Asie," by Paul Pelliot, in *Bull. Soc. de Géog. de Lille*, No. 4, Lille, 1910. [A black sketch map of the explorer's route from Andijan, in Russian Turkestan, across Chinese Turkestan to the province of Kan-su in China proper.]

INDIA. Geological Sketch Map showing the Manganese Ore Deposits of the Nágpur-Bálághát Area, Central Provinces. 1 inch=4 miles. *Memoirs of the Geol. Surv. of India*, Vol. 37, Part 4, "The Manganese Ore Deposits of India." Calcutta, 1909. [In colors.]

INDIA. (a) India. Showing Stations of Observation of the Magnetic Survey. 1:5,000,000=78.9 miles to an inch. *Extracts from Narrative Reports of Officers of the Survey of India for 1905-6*. Calcutta, 1908; (b) A map giving similar data for the Magnetic Survey of India, in 1906-7, is published in *Extracts*, etc., for 1909.

INDIA. India. Three maps showing the Progress of the Imperial Surveys in India to Oct., 1906, Oct., 1907, and Oct., 1908. 1:8,110,080=128 miles to an inch. In *General Reports of the Survey of India for 1905-6, 1906-7, and 1907-8*. Calcutta, 1907-8-9. [Shows in colors the work in progress or completed of the topographic and revenue surveys.]

EUROPE

AUSTRIA-HUNGARY. Karte der Meer und Hafenfernen von Österreich-Ungarn. 1:5,000,000=78.9 miles to an inch. Illustrates paper by Prof. Dr. J. Kiesewetter in *Pet. Mitt.*, Vol. 56, No. 4, Justus Perthes, Gotha, 1910. [Red lines drawn across the Empire and the Balkan Pen. show distances along them from ports; blue lines, distances from the sea.]

AUSTRIA-HUNGARY. Semmering-Gebeit. 1:100,000=1.5 mile to an inch. G. Freitag & Berndt, Vienna, 1910. [One of the excellent small maps of districts especially attractive to tourists, with routes in red and descriptive text on the reverse.]

AUSTRIA-HUNGARY. Das Verbreitungsgebiet der deutschen Sprache in Westungarn auf Grundlage der Volkszählung vom 31 Dezember, 1900. Blatt I: Gespanschaft Oedenburg. 1:200,000=3.1 miles to an inch. By Dr. Richard Pfaundler. Illustrates paper of same title in *Deutsche Erde*, Vol. 9, No. 2, Gotha, 1910. [Shows in colors the percentages of German and other population in the area mapped.]

GERMANY. Kartenskizzen zur Siedlungsgeographie Württembergs. 4 maps on 1 sheet. 1:1,000,000=15.78 miles to an inch. Illustrate "Die ländlichen Siedlungsformen Württembergs," by Dr. R. Gradmann, in *Pet. Mitt.*, Vol. 50, No. 4, Justus Perthes, Gotha, 1910. [Map 1 shows settlements with symbols to indicate geographical influences that helped to determine their location; 2, Pre-Roman Settlement; 3, Roman Settlement; 4, German Settlement after the dislodgement of the Romans.]

ENGLAND. The Basin of the Thames. 1:190,080=3 miles to an inch. 2 sheets. Constructed and Engraved by W. & A. K. Johnston, L't'd., Edinburgh and London, 1910. 98 in sheets. [A school wall map with 7 tints of brown to show elevations above the sea for every 100 feet to 800 and over; railroads and the old Roman roads are in red, clearly showing how the directions they take were influenced by the topography. The names of valleys and other physical features are printed but only the larger towns are indicated by place mark and initial letter, so that there is no overcrowding, and attention is not distracted from the forms of the land, the purpose of the map being to facilitate the study of the physiography of the Thames basin. Of late years, British publishers have produced a considerable number of excellent school wall maps of this kind. Good physical maps, like this one, of parts of our own country in which the government topographic sheets, the essential basis of such maps, have been completed, would supply a very desirable facility for schools.]

FRANCE. Die Besitzverhältnisse des französischen Eisenbahnnetzes nach der Verstaatlichung der Westbahn-Linien. 1:3,700,000=58.3 miles to an inch. With inset of Paris in 1:600,000. *Pet. Mitt.*, Vol. 56, No. 4, Gotha, 1910. [The state rail routes are distinguished from those in private hands and the color of each road refers to its name or its terminal points as explained in the legend.]

OCEANIA

GERMAN NEW GUINEA. Der Kaiserin-Augusta Fluss. Aufgenommen von Kapitän u. Offizieren des Dampfers "Peiho" Mai-Juni, 1909. 1:200,000=3.1 miles to an inch. Illustrates "Eine Bereisung des Kaiserin-Augusta-Flusses," by Dr. O. Reche, in *Globus*, Vol. 97, No. 18, Brunswick, Germany, 1910. [A detailed chart (black and white) of the lower part of this large river for nearly half of its course. The scale is large enough to show all the river windings, a large number of soundings are given in meters, and the plantations, villages, swamps and nature of vegetation along the river are indicated. A careful product of survey work, especially noteworthy as the main purposes of the expedition were ethnographical and anthropological.]

NEW POMERANIA. Aufnahmen auf der Gazelle Halbinsel. 1. Der nord-östliche Teil der Gazelle Halbinsel. 1:200,000; 2. Plan des Alten Kraters (Balanakaia). 1:15,000; 3. Der Innerste Teil der Offenen Bucht. 1:200,000; 4. Übersichtskarte. 1:2,000,000. Illustrates "Beiträge zur Kenntniss Neu Pommerns und des Kaiser-Wilhelms-Landes," by Prof. Dr. K. Sapper in *Pet. Mitt.*, Vol. 56, No. 4, Justus Perthes, Gotha, 1910. [The maps are based upon the surveys of Dr. Sapper, Dr. G. Friederici and W. Wernicke. Their routes are given and colors are used to show grasslands, forests, mixed grassland and forest, mangrove and European plantations.]

PHILIPPINE ISLANDS. (a) Approximate Tracks of the Typhoons of October, 1909; (b) Typhoon of Oct. 17 and 18. Rainfall (mm.) in 24 hours. Accompanied by charts and diagrams of Isobars and Barographic Records. [Illustrate descriptions of these typhoons in *Bull.* for Oct., 1909, Weather Bureau, Manila Central Observatory, Manila, 1910.]

PHILIPPINE ISLANDS. Earthquake Map of the Philippines, 1862-1909. No scale. Plate II accompanying "Catalogue of Violent and Destructive Earthquakes in the Philippines, etc." Manila Weather Bureau, Manila, 1910. [Shows the areas affected, the principal mountain systems, and soundings in fathoms.]

SAMOA. Die Samoa-Insel Savaii. 1:150,000=2.38 miles to an inch. With insets of parts of the coasts on a larger scale. By Dr. K. Wegener. Illustrates "Die Karte von Savaii," in *Pet. Mitt.*, Vol. 56, No. 4, Justus Perthes, Gotha, 1910. [The map is based upon compass bearings taken at various points on the coast with distances according to the chart of the German Hydrographic Office. Contour lines, with hundred meters interval, indicate the nearly regular slope from the central regions to the sea. Nearly the whole island is shown as covered with forest. The plantations, in the coastal region, are indicated and also the locations of the numerous volcanoes.]

ATLASES

Prof. A. L. Hickmanns Geographisch-Statistischer Universal-Taschen-Atlas. 64 pp. of Text and 65 double pp. of Maps and Diagrams. G. Freytag & Berndt, Vienna and Leipzig, 1910. [One of the most helpful and comprehensive of the pocket atlases, with special attention to statistical information. The atlas might give more attention to the Western World with advantage. It maps the United States only as a part of North America on the minute scale of 1:60,000,000.]

OTHER ACCESSIONS

ASIA

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